Multiple Choice Questions
Engineering Mathematics - II
Unit I: Differential Equations

Multiple Choice Questions:

Type: Linear Differential Equations and Reducible to Linear Differential Equation

1	Integrating factor of Linear Differential equation $\frac{dx}{dy} + yx = y^2$ is
A	$e^{\frac{y^2}{2}}$
B	$e^{\frac{x^2}{2}}$
C	y^2
D	$e^{\log y}$
Ans	**A**
Marks	**1**
Unit	**Ic**

2	The differential equation $\frac{dy}{dx} + \frac{y}{1+x^2} = x^2$ has integrating factor
A	$e^{\frac{1}{1+y^2}}$
B	$e^{\tan^{-1} x}$
C	$e^{\frac{1}{1+x^2}}$
D	$e^{\tan^{-1} y}$
Ans	**B**
Marks	**1**
Unit	**Ic**

3	The differential equation $\frac{dx}{dy}+\frac{x}{1+y^2}=y^2$ has integrating factor
A	$e^{\frac{1}{1+y^2}}$
B	$e^{\tan^{-1}x}$
C	$e^{\frac{1}{1+x^2}}$
D	$e^{\tan^{-1}y}$
Ans	**D**
Marks	**1**
Unit	**Ic**

4	The Bernoulli's differential equation $\frac{dy}{dx}-y\tan x=y^4\sec x$ reduces to Linear differential equation
A	$\frac{du}{dx}+(3\tan x)u=-3\sec x$ where $y^{-3}=u$
B	$\frac{du}{dx}-(3\tan x)u=3\sec x$ where $y^{-3}=u$
C	$\frac{du}{dx}+(\tan x)u=-\sec x$ where $y^{-3}=u$
D	None of these
Ans	**A**
Marks	**1**
Unit	**Ic**

5	The Bernoulli's differential equation $\frac{dy}{dx}-xy=-y^3e^{-x^2}$ reduces to Linear differential equation
A	$\frac{du}{dx}+(2x)u=2e^{-x^2}$ where $y^{-2}=u$
B	$\frac{du}{dx}+(x)u=e^{-x^2}$ where $y^{-2}=u$
C	$\frac{du}{dx}-(2x)u=-2e^{-x^2}$ where $y^{-2}=u$
D	None of these
Ans	**A**
Marks	**1**
Unit	**Ic**

6	The differential equation $\tan y\frac{dy}{dx}+\tan x=\cos^2 x\cos y$ reduces to Linear differential equation
A	$\frac{du}{dx}-(\tan x)u=-\cos^2 x$ where $\sec y=u$
B	$\frac{du}{dx}+(\tan x)u=\cos^2 x$ where $\sec y=u$
C	$\frac{du}{dx}+(\cot x)u=\cos^2 x$ where $\sec y=u$
D	None of these
Ans	**B**
Marks	**1**
Unit	**Ic**

7	The value of α so that $e^{\alpha x^2}$ is an integrating factor of Linear differential equation $\frac{dy}{dx} - xy = x$ is
A	$-\frac{1}{2}$
B	$\frac{1}{2}$
C	1
D	-2
Ans	**A**
Marks	**1**
Unit	**Ic**

8	If I_1, I_2 are integrating factors of the equation $x\frac{dy}{dx} + 2y = 1$ and $x\frac{dy}{dx} - 2y = 1$ then true relation is
A	$I_1 = -I_2$
B	$I_1 I_2 = 1$
C	$I_1 = x^2 I_2$
D	$I_1 I_2 = x^2$
Ans	**B**
Marks	**1**
Unit	**Ic**

9	The differential equation $\frac{dy}{dx}+\left(\frac{1}{x\log x}\right)y=\frac{2}{x}$ has integrating factor
A	$\log(\log x)$
B	$\log x$
C	$-\log x$
D	x
Ans	B
Marks	**1**
Unit	**Ic**

10	The general solution of $\frac{dy}{dx}+\left(\frac{1}{x\log x}\right)y=\frac{2}{x}$ with integrating factor $\log x$ is
A	$y.\log x=\log(\log x)+C$
B	$y.\log x=\frac{-1}{x}+C$
C	$y.\log x=\log x+C$
D	$y.\log x=(\log x)^2+C$
Ans	**D**
Marks	**1**
Unit	**Ic**

11	The differential equation $\frac{dy}{dx} + (\tanh x)y = 3\cosh x.\sinh x$ has integrating factor
A	$e^{\cosh x}$
B	$\tanh x$
C	$\cosh x$
D	$\sec hx$
Ans	**C**
Marks	**1**
Unit	**Ic**

12	The general solution of $\frac{dy}{dx} + (\tanh x)y = 3\cosh x.\sinh x$ with integrating factor $\cosh x$ is
A	$y.\cosh x = (\sinh x)^3 + C$
B	$y.\cosh x = (\cosh x)^3 + C$
C	$y.\cosh x = \cosh x + C$
D	$y.\cosh x = (\tanh x)^3 + C$
Ans	**B**
Marks	**1**
Unit	**Ic**

13	The differential equation $\frac{dy}{dx} + \tan x.y = \sin(2x)$ has integrating factor
A	$\log \sec x$
B	$\tan x \sec x$
C	$\log \sin x$
D	$\sec x$
Ans	**D**
Marks	**1**
Unit	**Ic**

14	The general solution of $\frac{dy}{dx} + \tan x.y = \sin(2x)$ with integrating factor $\sec x$ is
A	$y.\sec x = -2\cos x + C$
B	$y.\sec x = -\cos(2x) + C$
C	$y.\sec x = (\cos x)^2 + C$
D	$y.\sec x = \sec x + \tan x + C$
Ans	**A**
Marks	**1**
Unit	**Ic**

15	The general solution of $\frac{dy}{dx}+(2x).y=e^{-x^2}.x$ with integrating factor e^{x^2} is
A	$y.e^{x^2}=.e^{x^2}\,2x+C$
B	$y.e^{x^2}=.e^{x^2}x^3+C$
C	$y.e^{x^2}=\frac{x^2}{2}+C$
D	$y.e^{x^2}=e^{x^2}\frac{x^2}{2}+C$
Ans	**C**
Marks	**1**
Unit	**Ic**

16	The differential equation $(1+x)\frac{dy}{dx}-y=e^{x}(1+x)^2$ has integrating factor
A	$\frac{1}{1+x}$
B	$1+x$
C	e^{-x}
D	$\frac{1}{(1+x)^2}$
Ans	**A**
Marks	**1**
Unit	**Ic**

17	The differential equation $\left(1+x^2\right)\frac{dy}{dx}-2xy=2x\left(1+x^2\right)$ has integrating factor
A	$\frac{1}{1+x^2}$
B	$1+x^2$
C	$\log\left(1+x^2\right)$
D	x^2
Ans	**A**
Marks	**1**
Unit	**Ic**

18	The general solution of $\left(1+x^2\right)\frac{dy}{dx}-2xy=2x\left(1+x^2\right)$ with integrating factor $\frac{1}{1+x^2}$ is
A	$\frac{y}{1+x^2}=x^2+C$
B	$\frac{y}{1+x^2}=x^2+\frac{2x^3}{3}+C$
C	$\frac{y}{1+x^2}=\log\left(1+x^2\right)+C$
D	$\frac{y}{1+x^2}=2x\log\left(1+x^2\right)+C$
Ans	**C**
Marks	**1**
Unit	**Ic**

19	The differential equation $x^2 \frac{dy}{dx} + 2xy = \frac{2\log x}{x}$ has integrating factor
A	x^2
B	e^{x^2}
C	$\frac{1}{x^2}$
D	$\frac{2}{x}$
Ans	**A**
Marks	**1**
Unit	**Ic**

20	The general solution of Linear differential equation in y $x^2 \frac{dy}{dx} + 2xy = \frac{2\log x}{x}$ with integrating factor x^2 is
A	$x^2 y = \log x + C$
B	$x^2 y = \frac{x^3}{3} + C$
C	$x^2 y = \log(\log x) + C$
D	$x^2 y = (\log x)^2 + C$
Ans	**D**
Marks	**1**
Unit	**Ic**

21	The differential equation $\frac{dy}{dx} + (2\tan x)y = \sin x$ has integrating factor

A	$e^{(se\alpha)2}$
B	$\sec^2 x$
C	$-\cos x$
D	$2\log\sec x$
Ans	**B**
Marks	**1**
Unit	**Ic**

22	The general solution of $\frac{dy}{dx}+(2\tan x)y=\sin x$ with integrating factor $\sec^2 x$ is
A	$y\sec^2 x=-\cos x+C$
B	$y\sec^2 x=\tan x+C$
C	$y\sec^2 x=\sec x+C$
D	$y\sec^2 x=2\log(\sec x)+C$
Ans	**C**
Marks	**1**
Unit	**Ic**

23	The general solution of $\frac{dy}{dx}+(2\tan x)y=2\sec^2 x$ with integrating factor $\sec^2 x$ is

A	$y\sec^2 x = 2\left(\tan x + \frac{(\tan x)^3}{3}\right) + C$
B	$y\sec^2 x = 2\tan x + C$
C	$y\sec^2 x = (\tan x)^2 + C$
D	$y\sec^2 x = \frac{(\sec x)^5}{5} + C$
Ans	**A**
Marks	**1**
Unit	**Ic**

24	The differential equation Reduce to Linear differential equation in x $dx + xdy = e^{-y}\sec^2 y\,dy$ has integrating factor
A	e^y
B	$e^{\frac{x^2}{2}}$
C	e^x
D	e^{xy}
Ans	**A**
Marks	**1**
Unit	**Ic**

25	The Bernoulli's differential equation $\frac{dx}{dy} - xy = x^2y^3$ reduces to Linear differential equation

A	$\frac{du}{dy}+uy=y^3$ where $u=\frac{-1}{x}$
B	$\frac{du}{dy}+(2y)u=y^3$ where $u=\frac{-1}{x^2}$
C	$-\frac{du}{dy}-uy=\frac{y^3}{3}$ where $u=\frac{-1}{x}$
D	None of these
Ans	**C**
Marks	**1**
Unit	**Ic**

25	The Bernoulli's differential equation $\frac{dx}{dy}+\frac{x}{y}=\frac{x^{-3/4}}{y^4}$ reduces to Linear differential equation
A	$\frac{du}{dy}+\left(\frac{7}{3y}\right)u=\frac{7}{3y^4}$ where $u=x^{4/3}$
B	$\frac{du}{dy}+\left(\frac{4}{7y}\right)u=\frac{4}{7y^4}$ where $u=x^{3/4}$
C	$\frac{7}{4}\frac{du}{dy}+\frac{u}{y}=\frac{4}{7y^4}$ where $u=x^{3/4}$
D	$\frac{du}{dy}+\left(\frac{7}{4y}\right)u=\frac{7}{4y^4}$ where $u=x^{3/4}$
Ans	**D**
Marks	**1**
Unit	**Ic**

26	The Bernoulli's differential equation $\frac{dy}{dx}+x\sin(2y)=x^3\cos^2 y$ reduces to Linear differential equation

A	$\frac{du}{dx} - 2\sin(2y)u = -2\cos^2 y$ where $u = x^{-2}$
B	$\frac{du}{dy} + (2x)u = x^3$ where $u = \tan y$
C	$\frac{du}{dy} + (2x)u = \cos^2 y$ where $u = \tan y$
D	None of these
Ans	**B**
Marks	**1**
Unit	**Ic**

27	The Bernoulli's differential equation $x\frac{dy}{dx} + y.\log y = xye^x$ reduces to Linear differential equation
A	$\frac{du}{dy} + \frac{u}{x} = e^x$ where $u = \frac{1}{y}$
B	$\frac{du}{dx} + ux = e^x$ where $u = \log y$
C	$\frac{du}{dx} - \frac{x}{u} = e^x$ where $u = \log y$
D	$\frac{du}{dx} + \frac{u}{x} = e^x$ where $u = \log y$
Ans	**D**
Marks	**1**
Unit	**Ic**

27	The differential equation $\frac{dy}{dx} + \tan x.\tan y = \cos x.\sec y$ reduces to Linear differential equation

A	$\frac{du}{dx}+\tan x.u=\cos x$ where $u=\sin y$
B	$\frac{du}{dx}-\tan y.u=-\sec y$ where $u=\cos x$
C	$\frac{du}{dx}+\tan x.u=\cos x\tan y$ where $u=\sin y$
D	None of these
Ans	**A**
Marks	**1**
Unit	**Ic**

28	The differential equation $\sin x\frac{dy}{dx}+\cos x.y=2\sin^2 x.\cos x$ has integrating factor
A	$\sin x$
B	$e^{\sin x}$
C	$e^{\cot x}$
D	$-\cos ec^2 x$
Ans	**A**
Marks	**1**
Unit	**Ic**

29	The general solution of $\sin x\frac{dy}{dx}+\cos x.y=3\sin^2 x.\cos x$ with integrating factor $\sin x$ is

A	$y\sin x = \frac{3(\sin x)^4}{4}\ \cos x + \ C$
B	$y\sin x = \cos x + \ C$
C	$y\sin x = (\sin x)^3 + \ C$
D	$y\sin x = 3\frac{(\sin x)^4}{4} + \ C$
Ans	**C**
Marks	**1**
Unit	**Ic**

30	The differential equation $\frac{dy}{dx} = e^{x-y}\left(e^x - e^y\right)$ reduces to Linear differential equation
A	$\frac{du}{dx} + e^{2x}.u = e^x$ where $u = e^y$
B	$\frac{du}{dx} + e^x.u = e^{2x}$ where $u = e^y$
C	$\frac{du}{dx} - e^x.u = e^{2x}$ where $u = e^y$
D	$\frac{du}{dy} + e^y.u = e^{2y}$ where $u = e^x$
Ans	**B**
Marks	**1**
Unit	**Ic**

31	The differential equation $\frac{dx}{dy} - \frac{1}{y} = \frac{e^{2x}}{y^3}$ reduces to Linear differential equation

A	$\frac{du}{dy}-\frac{2}{y^3}.u=\frac{2}{y}$ where $u=e^{-2x}$
B	$\frac{du}{dy}+\frac{u}{y}=\frac{1}{y^3}$ where $u=e^{-2x}$
C	$\frac{du}{dy}-\frac{2}{y}.u=\frac{-2}{y^3}$ where $u=e^{-2x}$
D	$\frac{du}{dy}+\frac{2}{y}.u=\frac{-2}{y^3}$ where $u=e^{-2x}$
Ans	**D**
Marks	**1**
Unit	**Ic**

32	The differential equation $\frac{dy}{dx}+\frac{y\log y}{x}=\frac{y(\log y)^2}{x^2}$ reduces to Linear differential equation
A	$\frac{du}{dx}+\frac{u}{x^2}=\frac{-1}{x}$ where $u=\frac{1}{\log y}$
B	$\frac{du}{dx}-\frac{u}{x}=\frac{-1}{x^2}$ where $u=\frac{1}{\log y}$
C	$\frac{dy}{dx}+\frac{y}{x}=\frac{y\log y}{x^2}$ where $u=\log y$
D	$\frac{du}{dx}+\frac{2u}{x}=\frac{2}{x^2}$ where $u=\frac{1}{\log y}$
Ans	**B**
Marks	**1**
Unit	**Ic**

33	The differential equation $\frac{dy}{dx}+\left(\frac{\cos x-x\sin x}{x\cos x}\right)y=\frac{\sec x}{x}$ has integrating factor

A	$\dfrac{x}{\sec x}$
B	$\dfrac{\sec x}{x}$
C	$\cos x$
D	$\sec x$
Ans	**A**
Marks	**1**
Unit	**Ic**

34	The general solution of $\dfrac{dy}{dx}+\left(\dfrac{\cos x - x\sin x}{x\cos x}\right)y=\dfrac{\sec x}{x}$ with integrating factor $x\cos x$ is
A	$x\cos x.y = \dfrac{-1}{x}+ C$
B	$x\cos x.y = x + C$
C	$x\cos x.y = \dfrac{x^3}{3}+ C$
D	$x\cos x.y = \tan x.\log x + C$
Ans	**C**
Marks	**1**
Unit	**Ic**

35	The differential equation $\sec^2 y\dfrac{dy}{dx}+\tan x.\tan y = e^x \cos x$ reduces to Linear

	differential equation
A	$\frac{du}{dx} + \tan x.u = e^x(\cos x + \sin x)$ where $u = \tan y$
B	$\frac{du}{dx} + \tan x.u = e^x \cos x$ where $u = \tan y$
C	$\frac{du}{dx} + \tan x.\sin y.\cos y = e^x \cos x.\cos^2 y$ where $u = \tan y$
D	None of these
Ans	**B**
Marks	**1**
Unit	**Ic**

36	The Bernoulli's differential equation $x\frac{dy}{dx} + y = x^3 y^6$ reduces to Linear differential equation
A	$\frac{du}{dx} + \left(\frac{-5}{x}\right)u = -5x^2$ where $u = y^{-5}$
B	$\frac{du}{dx} + \left(\frac{1}{-5x}\right)u = \frac{x^2}{-5}$ where $u = y^{-5}$
C	$\frac{du}{dy} - uy = -y^6$ where $u = x^{-1}$
D	None of these
Ans	**A**
Marks	**1**
Unit	**Ic**

37	The differential equation $\cot y\dfrac{dy}{dx}+\dfrac{1}{x}=\dfrac{\sin y}{x^2}$ reduces to Linear differential equation
A	$\dfrac{du}{dx}+\left(\dfrac{-1}{x^2}\right)u=\dfrac{-1}{x}$ where $u=\cos ecy$
B	$\dfrac{du}{dx}-\tan y.u=-\tan y.\sin y$ where $u=x^{-1}$
C	$\dfrac{du}{dx}+\left(\dfrac{-1}{x}\right)u=\dfrac{-1}{x^2}$ where $u=\cos ecy$
D	None of these
Ans	**C**
Marks	**1**
Unit	**Ic**

38	The differential equation $\cos y-x\sin y\dfrac{dy}{dx}=\sec^2 x$ reduces to Linear differential equation
A	$\dfrac{du}{dx}+\dfrac{u}{x}=\dfrac{\sec^2 x}{x}$ where $u=\cos y$
B	$x\dfrac{du}{dx}+\dfrac{u}{x}=\dfrac{\sec^2 x}{x}$ where $u=\cos y$
C	$\dfrac{du}{dx}-\dfrac{u}{x}=\dfrac{\sec^2 x}{x}$ where $u=\sin y$
D	None of these
Ans	**A**
Marks	**1**
Unit	**Ic**

39	The differential equation Reduce to Linear differential equation in x $\frac{dx}{dy} = \frac{2y\log y + y - x}{y}$ has integrating factor
A	e^x
B	$\frac{1}{y}$
C	$\log y$
D	y
Ans	**D**
Marks	**1**
Unit	**Ic**

40	The Bernoulli's differential equation $\frac{dy}{dx} + 4y.\tan x = 4\sqrt{y}\,.\sec^2 x$ reduces to Linear differential equation
A	$\frac{du}{dx} + \left(\frac{\tan x}{2}\right)u = \frac{\sec^2 x}{2}$ where $u = \sqrt{y}$
B	$\frac{du}{dx} + (2\tan x)u = 2\sec^2 x$ where $u = \sqrt{y}$
C	$\frac{du}{dx} + \tan x.u = \sec^2 x$ where $u = \frac{1}{\sqrt{y}}$
D	$\frac{du}{dx} + (\sin x.\cos x)u = 1$ where $u = \sqrt{y}$
Ans	**B**
Marks	**1**
Unit	**Ic**

41	The differential equation $\tan y \dfrac{dy}{dx} + \tan x = \cos y . \cos^2 x$ reduces to Linear differential equation
A	$\dfrac{du}{dx} - (\tan x)u = \cos y . \cos^2 x$ where $u = \sec y$
B	$\dfrac{du}{dx} + (\sec^2 x)u = \cos y$ where $u = \sec y$
C	$\dfrac{du}{dx} + (\tan x)u = \cos^2 x$ where $u = \sec y$
D	None of these
Ans	**C**
Marks	**1**
Unit	**Ic**

42	The differential equation $x . \log x \dfrac{dy}{dx} + y = 2$ has integrating factor
A	e^x
B	$\log(\log x)$
C	x
D	$\log x$
Ans	**D**
Marks	**1**
Unit	**Ic**

43	The general solution of $x.\log x\dfrac{dy}{dx}+y=2$ with integrating factor $\log x$ is
A	$y\log x = 2\log x + C$
B	$y\log x = 2x(\log x - 1) + C$
C	$y\log x = 2\log(\log x) + C$
D	$y\log x = \dfrac{(\log x)^2}{2x} + C$
Ans	**A**
Marks	**1**
Unit	**Ic**

44	The Bernoulli's differential equation $x\dfrac{dy}{dx}+y=y^2\log x$ reduces to Linear differential equation
A	$\dfrac{du}{dx}-\dfrac{u}{x\log x}=\dfrac{-1}{x}$ where $u=y^{-1}$
B	$\dfrac{du}{dx}-\dfrac{u}{x}=\dfrac{-\log x}{x}$ where $u=y^{-1}$
C	$\dfrac{du}{dx}-\dfrac{u}{x}=\dfrac{-1}{x}$ where $u=y^{-1}$
D	$\dfrac{du}{dx}+\dfrac{u}{x}=\log x$ where $u=y^{-2}$
Ans	**B**
Marks	**1**
Unit	**Ic**

45	The differential equation $\frac{dy}{dx} + \frac{\sin(2y)}{x} = x^2 \cos^2 y$ reduces to Linear differential equation
A	$\frac{du}{dx} + (2x)u = 1$ where $u = \cos y$
B	$\frac{du}{dx} + (2x)u = x^2$ where $u = \tan y$
C	$\frac{du}{dx} + \left(\frac{2}{x}\right)u = x^2$ where $u = \tan y$
D	None of these
Ans	**C**
Marks	**1**
Unit	**Ic**

Engineering Mathematics II MCQs

UNIT 1-6

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Engineering Mathematics II

F.E. Semester II

Multiple Choice Questions

UNIT I (First Order Ordinary differential Equations)

Q. 1 The order and degree of the D.E

$\left(1+\left(\frac{dy}{dx}\right)^3\right)^{\frac{3}{2}}=\frac{d^2y}{dx^2}$is

a) 2,3 b) 2,2

c) 2,1 d) 3,2

Q. 2 The order and degree of the D.E

$\frac{d^3y}{dx^3}+\left(\frac{dy}{dx}\right)^2+\int y\,dx=sin$x is

a) 4,1 b) 4,2

c) 2,2 d) None of these

Q. 3 The order and degree of the D.E

$x+\left(\frac{dy}{dx}\right)^2=A\sqrt{1+\left(\frac{dy}{dx}\right)^2}$ is

a) 2,2 b) 1,2

c) 1,3 d) 1,4

Q. 4 The order and degree of the D.E

$$\frac{d^2y}{dx^2}+\left(\frac{dy}{dx}\right)^{10}=e^x sin(x)$$

a) 1,10 b) 1,2

c) 1,3 d) 1,4

Q. 5 The order and degree of the D.E

$y_3(1+y_1^2)-3y_1y_2^2=0$is

a) 3,1 b) 2,2

c) 3,2 d) 3,3

Q. 6 The order and degree of the D.E

$\frac{dy}{dx}+\frac{5k}{\left(\frac{dy}{dx}\right)^2}=6$is

a) 2,1 b) 2,2

c) 2,3 d) None of these

Q. 7 The order and degree of the D.E

$\left(\frac{dr}{dt}\right)^4+\left(\frac{d^2r}{dt^2}\right)^3+\left(\frac{d^3r}{dt^3}\right)^2+\left(\frac{d^4r}{dt^4}\right)$=0

a) 1,4 b) 4,4

c) 4,1 d) 3,2

Q. 8 The order and degree of the D.E

$\frac{dy}{dx}=\frac{ax+by+c}{3x+2by+5}\ is$

a) 1,0 b) 0,1

b) 1,1 d) None of these

Q. 9 The number of arbitrary constants in the general solution of ordinary differential equation is equal to

a)The order of D.E
b)The degree of D.E
c)Coefficient of highest order differential coefficient
d)None of these

Q.41 The necessary and sufficient condition that the D.E
M(x,y) dx + N(x,y) dy = 0 be exact is

a) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}; My + Nx \neq 0$

b) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}; My + Nx \neq 0$

c) $\frac{\partial M}{\partial y} \neq \frac{\partial N}{\partial x}; My + Nx \neq 0$

d) $\frac{\partial M}{\partial x} - \frac{\partial N}{\partial y} = 1; My + Nx \neq 0$

Q.42 If the integrating factor of differential equation $(x^2 + y^2 + 1)dx - 2xydy = 0$ is $\frac{1}{x^2}$ then its general solution is

a) $x - y = c$ b) $x^3 + 3y^2 = c$

c) $x^2 - y^2 - 1 = cx$ d) $x^2 + y^2 - 1 = cy$

Q.43 If the integrating factor of differential equation $(2x\, log\, x - xy)dy + 2ydx = 0$ is $\frac{1}{x}$ then its general solution is

a) $x^2 \log y - \frac{y}{3} = c$ b) $2y \log x - \frac{y^2}{2} = c$

c) $2x^2 \log x - xy^2 = c$ d) $x \log y - x = c$

Q.44 If the integrating factor of differential equation $(y^4 + 2y)dx + (xy^3 + 2y^4 - 4x)\, dy = 0$is $\frac{1}{y^3}$ then its general solution is

a)$\left(y + \frac{2}{y^2}\right)x + y^2 = c$ b)$\left(1 + \frac{1}{y^2}\right)x + y = c$

c)$xy^4 - 2xy + x^2y^4 = 0$ d)$y^3 + 2xy - 2x^2 = c$

Q.45 If the integrating factor of differential equation $(x^7y^2 + 3y)dx + (3x^8y - x)dy = 0$ is $\frac{y}{x^7}$then its general solution is

a) $x^3y + x^7y^4 = c$ b) $x^7y^3 - x^2 = cx^5$

c) $xy^3 - \frac{y^2}{2x^6} = c$ d) $xy + \frac{y^2}{x^7} = c$

Q.46 Integrating factor for the differential equation $\frac{dy}{dx} + \frac{4x}{x^2+1}y = \frac{1}{(x^2+1)^3}$ is

a) x^2 b) $1 + x^2$

c) $(1 + x^2)^{-2}$ d) $(1 + x^2)^2$

Q.47 If the integrating factor of differential equation $\frac{dx}{dy} + \mathrm{x} \sec y = \frac{2y \cos y}{1+\sin y}$ is $\sec y + \tan y$ then its general solution is

a) $(\sec y + \tan y)x = y^2 + c$

b) $x^2 \sec y + \tan y = c$

c) $\sec y + \tan y = xy + c$

d) $\sec y + x^2 \tan y = x^2 + c$

Q.48 The differential equation

$(1+\sin y)dx = (2y\cos y - x\sec y - x\tan y)dy$ is

a) Homogeneous b) Variable separable

c) Linear in x d) None of these

Q.49 The values of k which make $y = ke^{kx}$ a solution of $\frac{dy}{dx} - y = 0$ are

a) $1, 2$ b) $0, 1$

c) $0, -1$ d) ± 1

Q.50 The values of k which make $y = ke^{kx}$ a solution of $2\frac{dy}{dx} - 4y = 0$ are

a) $0, 2$ b) ± 1

c) ± 2 d) $2, 4$

Q.51 The order of differential equation whose general solution is $y = (c_1 + c_2)\sin(3x + c_3) + c_4 e^{4x+c_5}$, where c_1, c_2, c_3, c_4, c_5 are arbitrary constants, is

a) 5 b) 2

c) 4 d) 3

Q.52 The order of differential equation whose general solution is $y = \frac{c_1}{c_2}\cos(4x + c_3) + c_4 e^{2x-c_5}$, where c_1, c_2, c_3, c_4, c_5 are arbitrary constants, is

a) 2 b) 3

c) 4 d) 5

Q.53 The order of differential equation whose general solution is $c_1 y = c_2 + c_3 x + c_3 x^2$, where c_1, c_2, c_3 are arbitrary constants, is

a) 1 b) 2

c) 3 d) 4

Q.54 The order of differential equation whose general solution is $c_1 y e^{x+c_2} = c_3 x e^{4x+c_4}$, where c_1, c_2, c_3, c_4 are arbitrary constants, is

a) 1 b) 2

c) 3 d) 4

Q.55 The general solution of differential equation $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$ is

a) $e^x = x^2 + c$ b) $e^{x-y} = x^3 + c$

c) $e^y = e^x + \frac{x^3}{3} + c$ d) $y^2 = e^x - \frac{x^3}{3} + c$

Q.56 The general solution of differential equation $\sec^2 x \tan y\, dx + \sec^2 y \tan x\, dy = 0$ is

a) $\tan^2 x + \tan^2 y = c$

b) $\tan x \tan y = c$

c) $\sec^2 x \tan y + \sec^2 y \tan x = c$

d) $\sec^2 x \sec^2 y = c$

Q.57 The substitution for reducing non-homogeneous differential equation $\frac{dy}{dx} = \frac{2x-5y+3}{2x+4y-6}$ to homogeneous differential equation is

a) $x = X + 1,\ y = Y - 3$

b) $x = X + 2,\ y = Y + 2$

c) $x = X + 1,\ y = Y + 1$

d) $x = X - 1,\ y = Y + 2$

Q.58 The differential equation $(x^3 + 3y^2x)dx + (y^3 + 3x^2y)dy = 0$ is

a) Only homogeneous

b) Exact and homogeneous

c) Only exact

d) None of these

Q.59 The differential equation $\frac{dy}{dx} = \frac{2x-y}{x-y}$ is

a) Only exact b) Exact and homogeneous

c) Only homogeneous d) None of these

Q.60 The integrating factor for the linear differential equation $\frac{dy}{dx} + \frac{y}{\sqrt{x}} = \frac{e^{-2\sqrt{x}}}{\sqrt{x}}$ is

a) $e^{\sqrt{x}}$ b) $e^{\frac{1}{\sqrt{x}}}$

c) $e^{2\sqrt{x}}$ d) $e^{-\sqrt{x}}$

Q.61 If homogeneous D.E.

$$M(x,y)\,dx + N(x,y)\,dy = 0$$

is not exact then the integrating factor is

a) $\frac{1}{My+Nx}$; $My + Nx \neq 0$

b) $\frac{1}{Mx-Ny}$; $Mx - Ny \neq 0$

c) $\frac{1}{Mx+Ny}$; $Mx + Ny \neq 0$

d) $\frac{1}{My-Nx}$; $My - Nx \neq 0$

Q.62 If the D.E. $M(x,y)\,dx + N(x,y)\,dy = 0$ is not exact and it can be written as $yf_1(xy)dx + xf_2(xy)dy = 0$then the I.F. is

a) $\frac{1}{My+Nx}$; $My + Nx \neq 0$

b) $\frac{1}{Mx-Ny}$; $Mx - Ny \neq 0$

c) $\frac{1}{Mx+Ny}$; $Mx + Ny \neq 0$

d) $\frac{1}{My-Nx}$; $My - Nx \neq 0$

Q.63 If the D.E. $M(x,y)\,dx + N(x,y)\,dy = 0$is not exact and $\frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{M} = f(x)$ then th I.F. is

a) $e^{f(x)}$ b) $e^{\int f(x)dy}$

c) $f(x)$ d) $e^{\int f(x)dx}$

Q.64 If the D.E. $M(x,y)\,dx + N(x,y)\,dy = 0$is not exact and $\frac{\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}}{M} = f(y)$ then th I.F. is

a) $e^{f(y)}$ b) $e^{\int f(y)dx}$

c) $f(y)$ d) $e^{\int f(y)dy}$

Q.65 The total derivative of $x\,dy + y\,dx$ is

a) $d\left(\frac{y}{x}\right)$ b) $d\left(\frac{x}{y}\right)$

c) $d(xy)$ d) $d(x+y)$

Q.66 The total derivative of $x\,dy - y\,dx$ is with I.F. $\frac{1}{x^2}$

a) $d\left(\frac{y}{x}\right)$ b) $d\left(\frac{x}{y}\right)$

c) $d(\log\frac{x}{y})$ d) $d(x-y)$

Q.67 The D.E. $(x+y-2)dx + (x-y+4)dy = 0$ is of the form

a) Exact b) Homogeneous

c) Linear d) None of these

Q.68 The value of λ for which the D.E. $(xy^2 + \lambda x^2 y)dx + (x^3 + x^2 y)dy = 0$ is exact is

a) -3 b) 2

c) 3 d) 1

Q.69 The D.E.

$(ay^2 + x + x^8)dx + (y^8 - y + bxy)dy = 0$ is exact if

a) $b \neq 2a$ b) $b = a$

c) $a = 1, b = 3$ d) $b = 2a$

Q.70 The D.E. $(3 + by\cos x)dx + (2\sin x - 4y^3)dy = 0$ is exact if

a) $b = -2$ b) $b = 3$

c) $b = 0$ d) $b = 2$

Q.71 I.F. of homogeneous D.E. $(xy - 2y^2)dx + (3xy - x^2)dy = 0$ is

a) $\frac{1}{xy}$ b) $\frac{1}{x^2y^2}$

c) $\frac{1}{x^2y}$ d) $\frac{1}{xy^2}$

Q.72 I.F. of D.E. $(1 + xy)ydx + (x^2y^2 + xy + 1)xdy = 0$ is

a) $\frac{1}{x^2y}$ b) $-\frac{1}{x^3y^3}$

c) $\frac{1}{xy^2}$ d) $\frac{1}{x^2y^2}$

Q.73 I.F. of D.E. $(x^2 + y^2 + x)dx + (xy)dy = 0$ is

a) $\frac{1}{x}$ b) $\frac{1}{x^2}$

c) x^2 d) x

Q.74 I.F. of D.E. $\left(y + \frac{y^3}{3} + \frac{x^2}{2}\right)dx + \left(\frac{x + xy^2}{4}\right)dy = 0$ is

a) x^2 b) x^3

c) $\frac{1}{x}$ d) $\frac{1}{x^3}$

Q.75 I.F. of D.E.
$(2x\log x - xy)dy + (2y)dx = 0$is

a) $\frac{1}{x}$ b) $\frac{1}{x^2y^2}$

c) $\frac{1}{x^2}$ d) $\frac{1}{y}$

Q.76 I.F. of D.E.$(2xy^2 + ye^x)dx - e^x dy = 0$

a) $\frac{1}{x}$ b) $\frac{1}{y}$

c) $\frac{1}{x^2}$ d) $\frac{1}{y^2}$

Q.78 I.F. of D.E.
$(y^4 + 2y)dx + (xy^3 + 2y^4 - 4x)dy = 0$

a) $\frac{2}{x}$ b) $\frac{1}{y}$

c) $\frac{1}{y^3}$ d) $\frac{2}{y^2}$

Q.79 Solution of non—exact D.E

$(x^2 - 3xy + 2y^2)dx + x(3x - 2y)dy = 0$

with I.F.$\frac{1}{x^3}$is

a)$3\frac{y}{x} - \frac{y^2}{x^2} = C$ b)$\log x - 3\frac{y}{x} + \frac{y^2}{x^2} = C$

c)$\log x + 3\frac{y}{x} - 2\frac{y^2}{x^2} = C$ d)$\log x + 3\frac{y}{x} - \frac{y^2}{x^2} = C$

Q.80 Solution of non—exact D.E.

$(3xy^2 - y^3)dx + (xy^2 - 2x^2y)dy = 0$

with I.F.$\frac{1}{x^2y^2}$is

a) $3\log x - \frac{2y}{x^3} - 2\log y = C$

b) $3\log x + \frac{y}{x} - 2\log y = C$

c) $3\log x + \frac{y}{x} = C$

d) $\log x - \frac{y}{x} + 2\log y = C$

Q.81 Solution of non—exact D.E.
$(x^4e^x - 2mxy^2)dx + (2mx^2y)dy = 0$
with I.F.$\frac{1}{x^4}$is

a) $e^x + \frac{6my^2}{x^4} = C$ b)$e^x + \frac{2my^2}{x^2} = C$

c) $e^x + \frac{y^2}{x^2} = C$ d) $e^x + \frac{my^2}{x^2} = C$

Q.82 The differential equation
$\frac{dy}{dx} + P(x)y = Q(x)y^n$is

a)Linear equation b)Non-linear equation

c)Bernoulli's equation d)None of these

Q.83 The integrating factor for differential equation $(1 + y^2)\frac{dx}{dy} + x = e^{-\tan^{-1}y}$is

a) $\frac{1}{1+y^2}$ b)$e^{\tan^{-1}x}$

c) $e^{\tan^{-1}y}$ d)None of these

Q.84 The integrating factor of the non-exact differential equation
$(y^4 + 2y)dx + (xy^3 + 2y^4 - 4x)dy = 0$is

a) y^3 b) $1/x$

c) $1/x^3$ d) $1/y^3$

Q.85 The general solution of the exact differential equation $\frac{dy}{dx} = \frac{2x-3y+1}{3x+4y-5}$ is

a) $x^2 + 3xy + x - 2y^2 + 5y = c$
b) $x^2 - 3xy + x - 2y^2 + 5y = c$
c) $x^2 - 3xy - x + 2y^2 + 5y = c$
d) None of these

Q.86 The differential equation $\frac{dy}{dx} = \frac{3x+2y}{x+3}$ is

a) exact b)linear

c)non homogeneous d)homogeneous

Q.87 The differential equation $x\frac{dy}{dx} + \frac{y^2}{x} = y$ is

a) homogeneous b) exact

c) non- homogeneous d)none of these

Q.88 The substitution for reducing non-homogeneous differential equation $\frac{dy}{dx} = \frac{-x-2y}{y-1}$ to homogeneous differential equation is

a) $x = X - 1,\ y = Y - 3$

b) $x = X - 2,\ y = Y + 1$

c) $x = X + 1,\ y = Y + 1$

d) $x = X - 1,\ y = Y + 2$

Q.89 For what values of a and b, the differential equation $(y + x^3)dx + (ax + by^3)dy = 0$ is exact.

a) $b = 1,$ for all values of b

b) $a = 2, b = 1$

c) $a = 1,$ for all values of b

d) $a = -1, b = 3$

Q.90 For what values of a, the differential equation

$(ye^{xy} + ay^3)dx + (xe^{xy} + 12xy^2 - 2y)dy = 0$is exact.

a) $a = 2$ b) $a = 4$

c) $a = 3$ d) $a = 1$

ANSWERS

Unit-I (DifferentatialEquations)

1	b	**2**	A	**3**	d	**4**	d	**5**	a	**6**	d	**7**	c	**8**	b	**9**	a		
41	a	**42**	C	**43**	b	**44**	a	**45**	c	**46**	d	**47**	a	**48**	d	**49**	b	**50**	a
51	d	**52**	B	**53**	b	**54**	b	**55**	c	**56**	b	**57**	c	**58**	b	**59**	c	**60**	c
61	c	**62**	D	**63**	d	**64**	d	**65**	c	**66**	a	**67**	a	**68**	c	**69**	d	**70**	d
71	d	**72**	B	**73**	d	**74**	b	**75**	a	**76**	d	**77**	--	**78**	c	**79**	d	**80**	b
81	d	**82**	C	**83**	c	**84**	d	**85**	b	**86**	c	**87**	a	**88**	b	**89**	c	**90**	b

SKN Sinhgad Institute of Technology and Science , Lonavala

Engineering Mathematics II

F.E. Semester II

Multiple Choice Questions

UNIT-II APPLICATIONS OF D.E.

Q. 1 For finding orthogonal trajectory of $f(x,y,c)=0$ we replace $\frac{dy}{dx}$ by

a) $-dx/dy$ b) $-dy/dx$

c) $2dx/dy$ d) dy/dx

Q. 2 The orthogonal trajectory of $y=ax^2$ is

a) $x^2+y^2=c^2$ b) $x^2+(y^2/2)=c^2$

c) $(x^2/2)+y^2=c$ d) None of these

Q. 3 The orthogonal trajectory of parabola is

a) circle b) hyperbola

c) ellipse d) straight line

Q. 4 The orthogonal trajectory of the family of circles with centre at $(0,0)$ is a family of

a) circles b) Straight lines through $(0,0)$

c) any straight line d) parabola

Q. 5 The DE for the orthogonal trajectory of the family of curves $x^2+2y^2=c^2$ is

a) $x+2y\frac{dy}{dx}=0$ b) $2\frac{dx}{x}=\frac{dy}{y}$

c) $xdx+ydy=0$ d) $\frac{dx}{x}=\frac{dy}{y}$

Q. 6 The DE of orthogonal trajectory of the family of curves $r^2=a\sin 2\theta$ is

a) $\frac{dr}{r}=-\tan 2\theta\, d\theta$ b) $\frac{dr}{r}=\tan 2\theta\, d\theta$

c) $dr=\tan 2\theta\, d\theta$ d) None of these

Q. 7 The DE of orthogonal trajectory of the family of curves $r^2=a^2\cos 2\theta$ is

a) $r\frac{d\theta}{dr}=\tan 2\theta$ b) $rdr=\tan 2\theta\, d\theta$

c) $rdr=\cot 2\theta\, d\theta$ d) $rdr+\tan\theta\, d\theta=0$

Q. 8 If the DE of orthogonal trajectory of a curve is $r\frac{d\theta}{dr}+\cot(\theta/2)=0$ then its orthogonal trajectory is

a) $r=\cos\theta$ b) $r=c(1-\sin\theta)$

c) $r=c(1-\cos\theta)$ d) $r=b(1+\cos\theta)$

Q. 9 If temperature of surrounding medium is θ_0 and temperature of body at any time $t$is θ, then in a process of heating $d\theta/dt$ is

a) $\theta - \theta_0$ b) $k(\theta - \theta_0);\ \ k > 0$

c) $-k(\theta - \theta_0);\ \ k > 0$d) None of these

Q. 10 In certain data of newton's law of cooling, $-kt = \log\left(\frac{\theta-40}{60}\right)$ and at $t = 4, \theta = 60^0$, then the value of k is

a) $\log(1/3)$ b) $-\log(1/3)$

c) $4\log(1/3)$ d) $(1/4)\log 3$

Q. 11 If the temperature of water initially is 100^0C and $\theta_0 = 20^0C$, and water cools down to 60^0C in first 20 minutes with $k = \frac{1}{20}\log 2$, then during what time will it cool to 30^0C

a) 60 min b) 50 min

c) 1.5 hour d) 40 min

Q. 12 If a body originally at 80^0C, with $\theta_0 = 40^0C$ and $k = \frac{1}{20}\log 2$, then the temperature of body after 40 min is

a) 40^0C b) 50^0C

c) 80^0C d) 30^0C

Q. 13 If the body at 100^0C is placed in room whose temperature is 10^0C and cools to 60^0C in 5 minutes then the value of k is

a) $\log 2$ b) $-\log 2$

c) $(1/5)\log 2$s d) $5\log 2$

Q. 14 The linear form of DE for R-L series circuit with emf E is

a) $L\frac{di}{dt} + Ri = E$ b) $\frac{di}{dt} + \frac{R}{L}i = \frac{E}{L}$

c) $L\frac{di}{dt} + Ri = 0$d) none of these

Q. 15 The integrating factor for the DE of R-L series circuit with emf E is

a) $e^{\int Rdt}$ b) e^{Rt+c}

c) $e^{\int \frac{R}{L}dt}$ d) $e^{\int idt}$

Q. 16 If $i = \frac{E}{R} + ke^{-\frac{Rt}{L}}$ then the maximum value of $i$is

a) R/L b) E/R

c) −E/R d) 2R/L

Q. 17 The linear form of DE for R-C series circuit with emf E is

a) $Ri + \frac{q}{c} = E(t)$

b) $Ri + \frac{1}{C}\int i\,dt = E$

c) $R\frac{di}{dt} + \frac{i}{C} = \frac{dE}{dt}$

d) $\frac{di}{dt} + \frac{i}{RC} = \frac{1}{R}\frac{dE}{dt}$

Q. 18 The integrating factor for the DE of R-C series circuit with emf E is

a) $e^{\int RC dt}$ b) $e^{\int \frac{1}{RC} dt}$

c) $e^{\int \frac{1}{R} dt}$ d) $e^{\int \frac{1}{C} dt}$

Q. 19 If $i = \frac{E}{R}\left(1 - e^{-\frac{Rt}{L}}\right)$ then the 50% of maximum current is

a) E/R b) E/2R

c) 2E/R d) 2R/E

Q. 20 Which one of the following is not correct?

a) $F = ma$ b) $F = m\frac{dv}{dt}$

c) $F = m\,v\frac{dv}{dx}$ d) $F = m\,v\frac{dv}{dt}$

Q. 21 A motion of a body or particle along straight line is known as

a) rectilinear motion b) curvilinear motion

c) motion d) None of these

Q. 22 If a body of mass m falling from rest is subjected to the force of gravity and an air resistance proportional to the square of velocity kv^2, then the equation of motion is

a) $mv\frac{dv}{dx} = mg + kv^2$

b) $ma = -mg + kv^2$

c) $ma = mg - kv^2$

d) None of these

Q. 23 If a body opposed by force per unit mass of value cx and resistance per unit mass of value kv^2 then the equation of motion is

a) $a = cx - bv^2$

b) $a = bv^2 - cx$

c) $v\frac{dv}{dx} = -cx - bv^2$

d) $v\frac{dv}{dx} = cx + bv^2$

Q. 24 Let O be a fixed point on a straight line. Let P be the position of particle at any time t and OP=x. Then the equation of SHM is

a) $\frac{d^2x}{dt^2} = -kx$ b) $\frac{d^2x}{dt^2} = kx$

c) $\frac{dv}{dx} = kx^2$ d) None of these

Q. 25 In SHM, $v^2 = -3x^2 + 112$, then its greatest acceleration is

a) $\sqrt{336}$ b) $\sqrt{333}$

c) $\sqrt{330}$ d) $\sqrt{363}$

Q. 26 The quantity of heat in a body is proportional to its

a) mass only b) temperature only

c) mass and temperature d) none of these

Q. 27 If $\frac{d^2x}{dt^2} = -\omega^2 x$ is differential equation of SHM then period T is

a) $2\pi/\omega$ b) $2\pi/\sqrt{\omega}$

c) π/ω d) $-2\pi/\omega$

Q. 28 The motion of a particle moving along a straight line is $\frac{d^2x}{dt^2} + 16x = 0$, then its period is

a) $2\pi/\sqrt{2}$ b) $\pi/2$

c) 2π d) π

Q. 29 If $\frac{d^2x}{dt^2} = -\omega^2 x$ is differential equation of SHM then frequency of SHM is

a) $2\pi/\sqrt{k}$ b) $\sqrt{k}/2\pi$

c) $2\pi/k$ d) $k/2\pi$

Q. 30 The particle executing SHM has maximum acceleration when

a) displacement is zero

b) velocity is maximum

c) displacement is maximum

d) velocity is zero

Q. 31 An ice ball melts. The rate at which it melts is proportional to the amount of the ice at that time. If half of the quantity of ice melts in 20 minutes then after one hour the amount of ice left will be

a) 1/8th of the original

b) 1/4th of the original

c) 1/3rd of the original

d) Nothing will be left

Q.32 The orthogonal trajectories of the series of hyperbolas $xy = c^2$ is

a) $x^2 + y^2 = c^2$ b) $x^2y^2 = c^2$

c) $y^2 - x^2 = c^2$ d) None of these

Q. 33 The differential equation of orthogonal trajectories of family of straight lines $y = mx$ is

a) $x\,dx - y\,dy = 0$ b) $ydx - xdy = 0$

c) $x\,dx + ydy = 0$ d) $ydx + xdy = 0$

Q. 34 Let the population of country be decreasing at the rate proportional to its population. If the population has decreased to 25% in 10 years, how long will it take to half.

a) 20 years b) 8.3 years

c) 15 years d) 5 years

Q. 35 The orthogonal trajectories of the family of straight lines $y = mx$ is

a) $x^2 - y^2 = c^2$ b) $x^2 = my^2$

c) $y^2 = m^2x^2$ d) $x^2 + y^2 = c^2$

Q. 36 The set of orthogonal trajectories to a family of curves whose DE is $\phi\left(x, y, \frac{dy}{dx}\right) = 0$ is obtained by DE

a) $\phi\left(x, y, x\frac{dy}{dx}\right) = 0$

b) $\phi\left(x, y, \frac{-dx}{dy}\right) = 0$

c) $\phi\left(x, y, \frac{dy}{dx}\right) = 0$

d) $\phi\left(x, y, \frac{-dy}{dx}\right) = 0$

Q. 37 The orthogonal trajectories of the family of curves $r\cos\theta = a$ is

a) $r\sin\theta = c$ b) $r\tan\theta = c$

c) $\frac{r}{\sin\theta} = c$ d) None of these

Q. 38 If 10 grams of some radioactive substance reduces to 8 gm in 60 years, in how many years will 2 gm of it will be left ?

a) 120 yrs b) 378 yrs

c) 220 yrs d) 433 yrs

Q. 39 Voltage drop across inductance L is given by

a) Li b) $L\frac{di}{dt}$

c) $\frac{dL}{dt}$ d) None of these

Q. 40 A ball at temperature of 32^0C is kept in a room where the temperature is 10^0C. If the ball cools to 27^0C in hour then its temperature is given by

a) $T = 22\,e^{0.205\,t}$

b) $T = 10\,e^{1.163t}$

c) $T = 10 + 22e^{-0.258t}$

d) $T = 32 - 10e^{-0.093t}$

ANSWERS

Unit-II (Applications of D.E.)

1	b	**2**	c	**3**	c	**4**	b	**5**	b	**6**	A	**7**	a	**8**	d	**9**	b	**10**	D
11	a	**12**	b	**13**	c	**14**	b	**15**	c	**16**	B	**17**	d	**18**	b	**19**	b	**20**	D
21	a	**22**	c	**23**	c	**24**	a	**25**	a	**26**	C	**27**	a	**28**	b	**29**	b	**30**	D
31	a	**32**	c	**33**	c	**34**	b	**35**	d	**36**	B	**37**	a	**38**	d	**39**	b	**40**	C

Unit –III
Integral Calculus

Reduction Formulae

1 The value of the integral $\int_0^{\frac{\pi}{2}} \sin^n x\,dx$, for even n is

a) $\frac{(n-1)\cdot(n-3)\cdot\ \cdots\cdot 3\cdot 1}{(n)\cdot(n-2)\cdot\ \cdots\cdot 4\cdot 2}\cdot\pi$ b) $\frac{(n-1)\cdot(n-3)\cdot\ \cdots\cdot 3\cdot 1}{(n)\cdot(n-2)\cdot\ \cdots\cdot 4\cdot 2}\cdot\frac{\pi}{2}$

c) $\frac{(n-1)\cdot(n-3)\cdot\ \cdots\cdot 3\cdot 1}{(n)\cdot(n-2)\cdot\ \cdots\cdot 4\cdot 2}\cdot 2\pi$ d) 0

2 The value of the integral $\int_0^{\pi} \cos^n x\,dx$, for odd n is

a) $\frac{(n-1)\cdot(n-3)\cdot\ \cdots\cdot 3\cdot 1}{(n)\cdot(n-2)\cdot\ \cdots\cdot 4\cdot 2}\cdot\pi$ b) $\frac{(n-1)\cdot(n-3)\cdot\ \cdots\cdot 3\cdot 1}{(n)\cdot(n-2)\cdot\ \cdots\cdot 4\cdot 2}\cdot\frac{\pi}{2}$

c) $\frac{(n-1)\cdot(n-3)\cdot\ \cdots\cdot 3\cdot 1}{(n)\cdot(n-2)\cdot\ \cdots\cdot 4\cdot 2}\cdot 2\pi$ d) 0

3 The value of the integral $\int_0^{2\pi} \sin^n x\,dx$, for odd n is

a) $\frac{(n-1)\cdot(n-3)\cdot\ \cdots\cdot 3\cdot 1}{(n)\cdot(n-2)\cdot\ \cdots\cdot 4\cdot 2}\cdot\pi$ b) $\frac{(n-1)\cdot(n-3)\cdot\ \cdots\cdot 3\cdot 1}{(n)\cdot(n-2)\cdot\ \cdots\cdot 4\cdot 2}\cdot\frac{\pi}{2}$

c) $\frac{(n-1)\cdot(n-3)\cdot\ \cdots\cdot 3\cdot 1}{(n)\cdot(n-2)\cdot\ \cdots\cdot 4\cdot 2}\cdot 2\pi$ d) 0

4 The value of the integral $\int_0^{2\pi} \cos^n x\,dx$, for odd n is

a) $\frac{(n-1)\cdot(n-3)\cdot\ \cdots\cdot 3\cdot 1}{(n)\cdot(n-2)\cdot\ \cdots\cdot 4\cdot 2}\cdot\pi$ b) $\frac{(n-1)\cdot(n-3)\cdot\ \cdots\cdot 3\cdot 1}{(n)\cdot(n-2)\cdot\ \cdots\cdot 4\cdot 2}\cdot\frac{\pi}{2}$

c) $\frac{(n-1)\cdot(n-3)\cdot\ \cdots\cdot 3\cdot 1}{(n)\cdot(n-2)\cdot\ \cdots\cdot 4\cdot 2}\cdot 2\pi$ d) 0

5 If $I_n = \int_0^{\pi/4} \tan^n x\,dx$ then the value of $I_n + I_{n+2}$ is

a) $n+1$ b) n

c) $1/(n+1)$ d) $1/n$

6 If $I_n = \int_{\pi/4}^{\pi/2} \cot^n x\,dx$ and $I_n = \frac{1}{n-1} - I_{n-2}$, then the value of I_6 is

a) $\frac{13}{15}$ b) $\frac{13}{15}+\frac{\pi}{4}$

c) $\frac{13}{15}-\frac{\pi}{4}$ d) $\frac{13}{15}-\frac{\pi}{2}$

7 If $I_n = \int_0^{\pi/4} \sin^{2n} x\ dx$ and $I_n = \left(1-\frac{1}{2n}\right) I_{n-1} -$

$\frac{1}{n2^{n+1}}$, then the value of $\int_0^{\pi/4} \sin^4 x \; dx$ is

a) $\frac{3\pi}{32}+\frac{1}{4}$ b) $\frac{3\pi}{32}-\frac{1}{4}$

c) $\frac{\pi}{16}-\frac{1}{4}$ d) $\frac{3\pi}{16}+\frac{1}{4}$

8 If $I_{m,n} = \int_0^{\pi/2} (\cos^{\mathrm{m}} x)(\sin nx)dx$ and $I_{m,n} = \frac{1+m\, I_{m-1,n-1}}{m+n}$, then the value of $\int_0^{\pi/2} (\cos^2 x)(\sin 4x)dx$ is

a) 3 b) 2

c) 1/3 d) 2/3

9 If $I_n = \int_0^{\pi/2} x \cdot \sin^n x \cdot dx$ and $I_n = \frac{n-1}{n} I_{n-2} + \frac{1}{n^2}$, then the value of $\int_0^{\pi/2} x \cdot \sin^4 x \cdot dx$

a) $\frac{3\pi^2}{64}+\frac{1}{4}$ b) $\frac{\pi^2}{64}+\frac{1}{4}$

c) $\frac{3\pi^2}{32}-\frac{1}{4}$ d) $\frac{3\pi^2}{64}-\frac{1}{4}$

10 If $I_n = \int_0^{\pi/2} x \cdot \sin^n x \cdot dx$ and $I_n = \frac{n-1}{n} I_{n-2} + \frac{1}{n^2}$, then the value of $\int_0^{\pi/2} x \cdot \sin^3 x \cdot dx$

a) 5/3 b) 1/9

c) 7/9 d) ¾

11 If $I_n = \int_0^{\infty} e^{-ax} \sin^{\mathrm{n}} x \, dx$ and $(n^2 + a^2)I_n = n(n-1)I_{n-2}$, then the value of $\int_0^{\infty} e^{-2x} \sin^4 x \, dx$

a) 3/20 b) 3/40

c) 40/3 d) 3

12 The value of the integral $\int_0^{\pi/2} \sin^5 x \; dx$ is

a) $8\pi/30$ b) $\pi/2$

c) 8/15 d) 15/8

13 The value of the integral $\int_0^{\pi/2} \cos^6 x \; dx$ is

a) 0 b) 5/16

c) 5/32 d) $5\pi/32$

14 The value of the integral $\int_0^{\pi} \sin^5 x \; dx$ is

a) $8\pi/15$ b) $\pi/2$

c) 16/15 d) 0

15 The value of the integral $\int_0^{\pi} \sin^6 x \; dx$ is

a) 0 b) 5/16

c) 5/32 d) $5\pi/32$

16 The value of the integral $\int_0^{2\pi} \cos^5 x \; dx$ is

a) 0 b) 5/16

c) 5/32 d) $5\pi/32$

17 The value of the integral $\int_0^{2\pi} \sin^4 x \; dx$ is

a) $3\pi/16$ b) 0

c) $3\pi/4$ d) 3/8

18 The value of the integral $\int_0^{\pi/2} \sin^4 x \cos^3 x \; dx$ is

a) $\pi/35$ b) 2/35

c) 0 d) 53/2

19 The value of the integral $\int_0^{\pi/2} \sin^4 x \cos^4 x \; dx$ is

a) 0 b) 3/128

c) 3/256 d) $3\pi/256$

20 The value of the integral $\int_0^{\pi} \sin^4 x \cos^3 x \; dx$ is

a) 0 b) 3/128

c) 3/256 d) $3\pi/256$

21 The value of the integral $\int_0^{2\pi} \sin^4 x \cos^2 x \; dx$ is

a) $\pi/8$ b) $\pi/4$

c) $\pi/2$ d) 0

22 The reduction formula for $\int_0^{\pi/2} \sin^{\mathrm{m}} x \cos^{\mathrm{n}} x \, dx$ is

a) $I_{m,n} = \frac{n-1}{m+n} I_{m,n-2}$ b) $I_{m,n} = \frac{n}{m+n} I_{m-1,n-1}$

c) $I_{m,n} = \frac{n-1}{m+n} I_{m-2,n}$ d) $I_{m,n} = \frac{n}{m+n} I_{m-2,n-2}$

23 The value of $\int_{-\pi/2}^{\pi/2} \sin^4 x\, dx$ is

a) $3\pi/16$ b) $3\pi/8$

c) $3\pi/4$ d) 0

24 The value of $\int_{-\pi/2}^{\pi/2} \sin^4 x \cos^2 x\, dx$ is

a) 0 b) $\pi/4$

c) $\pi/16$ d) $\pi/32$

25 The value of $\int_{-2\pi}^{2\pi} \sin^3 x \cos^2 x\, dx$ is

a) 0 b) $\pi/4$

c) $\pi/16$ d) $\pi/32$

26 If $I_n = \int_0^\infty e^{-ax} \sin^n x\, dx$ and $I_n = \frac{n(n-1)}{n^2+a^2} I_{n-2}$ then the value of $\int_0^\infty e^{-2x} \sin^2 x\, dx$ is

a) ½ b) ¼

c) 1/8 d) 2

Beta and Gamma Functions

1 The formula for $\Gamma(n+1)$ is

a) $\int_0^\infty e^{-x} x^{n-1} dx$ b) $\int_0^\infty e^{-x} x^{n} dx$

c) $2\int_0^\infty e^{-x} x^{n-1} dx$ d) $\int_0^\infty e^{-x} x^{n-2} dx$

2 The value of the integral $\int_0^\infty e^{-4x} x^3\, dx$ is

a) 4! b) 3!

c) $\frac{3!}{64}$ d) $\frac{3!}{256}$

3 The value of $\Gamma\left(\frac{1}{3}\right)\Gamma\left(\frac{2}{3}\right)$ is

a) $2\pi/\sqrt{3}$ b) $\pi/\sqrt{3}$

c) 2π d) $2/\sqrt{3}$

4 The value of the integral $\int_0^\infty 3^{-x}\, dx$ is

a) $1/\log 3$ b) $-1/\log 3$

c) $\log 3$ d) $-\log 3$

5 The value of $\int_0^1 (\log x)^n\, dx$ is

a) $(-1)^n \Gamma n$ b) $(\log n)\Gamma n$

c) Γn d) $\Gamma(n+1)$

6 The value of $\int_0^1 \log x\, dx$ is

a) 1 b) 2

c) −1 d) −2

7 The value of $B(3,3)$ is

a) 30 b) 9

c) 1/30 d) 1/9

8 The value of $n \cdot B(m+1, n)$ is

a) $B(m,n)$ b) $m \cdot B(m,n)$

c) $BB(mm, nn+1)$ d) $m \cdot B(m, n+1)$

11 By Duplication formula, the value of $\Gamma m \cdot \Gamma(m+\frac{1}{2})$ is

a) $\frac{\sqrt{\pi}}{2^{m-1}}\Gamma(2m)$ b) $\frac{\sqrt{\pi}}{2^{2m-1}}\Gamma(m)$

c) $\frac{\sqrt{\pi}}{2^{m}}\Gamma(2m)$ d) $\frac{\sqrt{\pi}}{2^{2m-1}}\Gamma(2m)$

12 The value of $\int_0^\infty e^{-4x}x^{3/2}dx$ is

a) $\frac{3\sqrt{\pi}}{128}$ b) $\frac{3\pi}{128}$

c) $\frac{\sqrt{\pi}}{64}$ d) $\frac{\pi}{64}$

13 The value of the integral $\int_1^\infty \frac{dx}{x^{p+1}(x-1)^q}$ is

a) $B(p,q))$ b) $B(p+q,q)$

c) $B(p,1-q)$ d) $B(p+q,1-q)$

14 The value of the integral $\int_0^\infty \sqrt{x}\, e^{-\sqrt{x}}dx$ by the substitution $\sqrt{x}=t$ is

a) 1 b) 2

c) 3 d) 4

15 The value of the integral $\int_0^\infty x^9\, e^{-2x^2}dx$ by the substitution $x^2=t$ is

a) 4!/64 b) 4!/32

c) 5!/64 d) 5!/32

16 The value of the integral $\int_0^\infty \frac{x^5}{5^x}dx$ by using substitution $5^x=e^t$ is

a) $120/(\log 5)^4$ b) $24/(\log 4)^5$

c) $120/(\log 5)^5$ d) $24/(\log 4)^4$

17 The value of the integral $\int_0^\infty \frac{dx}{\sqrt{x\log\left(\frac{1}{x}\right)}}$ by using the substitution $\log\left(\frac{1}{x}\right)=t$ is

a) $\sqrt{\pi}/2$ b) $\sqrt{2\pi}$

c) $\sqrt{\pi}$ d) $2\sqrt{\pi}$

18 Value of $\int_0^{\pi/2}\sqrt{\tan x}\,dx$ is

a) $\frac{1}{2}B\left(\frac{3}{4},\frac{1}{4}\right)$ b) $\frac{1}{2}B\left(\frac{3}{4},\frac{3}{4}\right)$

c) $B\left(\frac{3}{4},\frac{1}{4}\right)$ d) $B\left(\frac{3}{4},\frac{3}{4}\right)$

19 Value of $\int_0^{\pi/2}\sqrt{\cot x}\,dx$ is

a) $\frac{1}{2}B\left(\frac{3}{4},\frac{1}{4}\right)$ b) $\frac{1}{2}B\left(\frac{3}{4},\frac{3}{4}\right)$

c) $B\left(\frac{3}{4},\frac{1}{4}\right)$ d) $B\left(\frac{3}{4},\frac{3}{4}\right)$

20 Value of $\int_0^{\pi/2}\sqrt{2\sin 2x}\,dx$ is

a) $\frac{1}{2}B\left(\frac{3}{4},\frac{1}{4}\right)$ b) $\frac{1}{2}B\left(\frac{3}{4},\frac{3}{4}\right)$

c) $B\left(\frac{3}{4},\frac{1}{4}\right)$ d) $B\left(\frac{3}{4},\frac{3}{4}\right)$

21 Value of $B\left(\frac{3}{4},\frac{1}{4}\right)$ is

a) 2π b) $\pi\sqrt{2}$

c) $\pi/2$ d) $\sqrt{2}$

22 If $B(n,2)=\frac{1}{6}$ and n is a positive integer then value of n is

a) 1 b) 2

c) 3 d) 4

23 If $B(n+1,1)=\frac{1}{4}$ and n is a positive integer then value of n is

a) 1 b) 2

c) 3 d) 4

24 The value of $\int_0^\infty \frac{x^{m-1}-x^{n-1}}{(1+x)^{m+n}}dx$ is

a) 0 b) $\frac{B(m,n)}{2}$

c) $2B(m,n)$ d) 1

25 The value of $\int_0^\infty \frac{x^{m-1}+x^{n-1}}{(1+x)^{m+n}}dx$ is

a) 0 b) $\frac{B(m,n)}{2}$

c) $2B(m,n)$ d) 1

Differentiation Under Integral Sign

1 If $I(\alpha)=\int_a^b f(x,\alpha)\,dx$, where α is parameter and a,b are constants then by DUIS rule, $\frac{dI(\alpha)}{d\alpha}$ is

a) $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx$ b) $\int_a^b \frac{\partial}{\partial x} f(x,\alpha)dx$

c) $f(a,\alpha)-f(b,\alpha)$ d) $f(x,\alpha)$

2 If $I(\alpha)=\int_a^b f(x,\alpha)\,dx$, where a,b are functions of parameter α, then by DUIS rule, $\frac{dI(\alpha)}{d\alpha}$ is

a) $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx$ b) $f(b,\alpha)\frac{db}{d\alpha}-f(a,\alpha)\frac{da}{d\alpha}$

c) $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx+f(b,\alpha)\frac{db}{d\alpha}-f(a,\alpha)\frac{da}{d\alpha}$ d) $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx+f(a,\alpha)\frac{da}{d\alpha}-f(b,\alpha)\frac{db}{d\alpha}$

3 If $I(a)=\int_0^\infty \frac{e^{-x}}{x}(1-e^{-ax})dx$ $(a>-1)$ then the value of $\frac{dI(a)}{da}$ is

a) $1/(a+1)$ b) $-1/(a+1)$

c) $\log(a+1)$ d) 0

4 If $I(a)=\int_0^\infty \frac{\cos\lambda x}{x}(e^{-ax}-e^{-bx})dx;\quad a>0,b>0$ then

a) $\frac{dI(a)}{da}+\int_0^\infty e^{-ax}\cos\lambda x\,dx=0$ b) $\frac{dI(a)}{da}-\int_0^\infty e^{-ax}\cos\lambda x\,dx=0$

c) $\frac{dI(a)}{da}+\int_0^\infty e^{-ax}\sin\lambda x\,dx=0$ d) $\frac{dI(a)}{da}-\int_0^\infty e^{-ax}\sin\lambda x\,dx=0$

5 The value of $\frac{d}{da}\left[\int_0^\infty \frac{e^{-x}}{x}\left(a-\frac{1}{x}+\frac{e^{-ax}}{x}\right)dx\right]$, where a is parameter, is

a) $\int_0^\infty \frac{e^{-x}}{x}(1-e^{-ax})dx$ b) $\int_0^\infty \frac{e^{-x}}{x}(1+e^{-ax})dx$

c) $\int_0^\infty \frac{e^{-x}}{x}\left(1-\frac{e^{-ax}}{a}\right)dx$ d) $\int_0^\infty \frac{e^{-x}}{x}\left(1+\frac{e^{-ax}}{a}\right)dx$

6 The value of $\frac{d}{db}\left[\int_0^\infty \frac{e^{-ax}-e^{-bx}}{x}dx\right]$ where $a>0,b>0$, is

a) $\int_0^\infty \frac{be^{-bx}}{x}dx$ b) $\int_0^\infty \frac{-be^{-bx}}{x}dx$

c) $\int_0^\infty e^{-ax}dx$ d) $\int_0^\infty e^{-bx}dx$

7 If $I(a)=\int_a^{a^2} e^{ax^2}dx$ then $\frac{dI(a)}{da}=$

a) $\int_a^{a^2} x^2e^{ax^2}dx+e^{a^5}-e^{a^3}$ b) $\int_a^{a^2} 2axe^{ax^2}dx+2ae^{a^5}-e^{a^3}$

c) $\int_a^{a^2} x^2 e^{ax^2} dx + 2ae^{a^5} - e^{a^3}$ d) $\int_a^{a^2} e^{ax^2} dx + e^{a^5} - 2ae^{a^3}$

8 If $II(aa) = \int_0^\infty \frac{e^{-ax}-e^{-bx}}{x} dx$ and $I'(a) = -\frac{1}{a}$ then the value of $I(a)$ is

a) $\log a$ b) $\log(a/b)$

c) $\log b$ d) $\log(b/a)$

9 If $F(x) = \int_0^x (x-t)^2 G(t) dt$ then $\frac{dF}{dx}$ is

a) $\int_0^x -2(x-t)G(t)dt$ b) $\int_0^x (x-t)G'(t)dt$

c) $\int_0^x 2(x-t)G(t)dt$ d) $\int_0^x (x-t)^2 G'(t)dt$

10 If $\frac{dI}{da} = \frac{a}{a^2+1}$, then the value of integral $I(a) = \int_0^\infty \frac{e^{-x}-e^{-ax}}{x \sec x} dx$ is

a) $\frac{1}{2}\log\left(\frac{a^2+1}{2}\right)$ b) $\frac{1}{2}\log\left(\frac{a^2+1}{a}\right)$

c) $\log(a^2+1)$ d) $-\log(a^2+1)$

11 The value of the integral $I(a) = \int_0^{\pi/2} \frac{\log(1+a\sin^2 x)}{\sin^2 x} dx$ with $\frac{dI}{da} = \frac{\pi}{2\sqrt{a+1}}$ is

a) $\pi\sqrt{a+1}$ b) $\pi[\sqrt{a+1}+1]$

c) $(a+1)^{3/2}$ d) $\pi[\sqrt{a+1}-1]$

12 If $I(x) = \int_0^x f(t) \sin a(x-t)\, dt$, then $\frac{dI}{dx}$ is

a) $\int_0^x f(t)\cos a(x-t)\, dt$ b) $\int_0^x a\, f(t)\cos a(x-t)\, dt$

c) $\int_0^x f'(t)\sin a(x-t)\, dt$ d) $\int_0^x a\, f'(t)\sin a(x-t)\, dt$

13 If $I(a) = \int_0^{a^2} \tan^{-1}\left(\frac{x}{a}\right) dx$, then $\frac{dI}{da}$ is

a) $\int_0^{a^2} \frac{\partial}{\partial a}\tan^{-1}\left(\frac{x}{a}\right) dx + 2a\tan^{-1} a$ b) $\int_0^{a^2} \frac{\partial}{\partial a}\tan^{-1}\left(\frac{x}{a}\right) dx + a^2\tan^{-1} a$

c) $\int_0^{a^2} \frac{\partial}{\partial x}\tan^{-1}\left(\frac{x}{a}\right) dx + 2a\tan^{-1} a$ d) $\int_0^{a^2} \frac{\partial}{\partial a}\tan^{-1}\left(\frac{x}{a}\right) dx + a\tan^{-1} a^2$

14 The value of $\frac{d}{da}\left[\int_a^{a^2} \frac{dx}{x+a}\right]$ is

a) $\int_a^{a^2} \frac{dx}{(x+a)^2} + \frac{2}{a+1} + \frac{1}{2a}$ b) $\int_a^{a^2} -\frac{dx}{(x+a)^2} + \frac{2}{a^2+a} - \frac{1}{2a}$

c) $\int_a^{a^2} -\frac{dx}{(x+a)^2} + \frac{2}{a+1} - \frac{1}{2a}$ d) $\int_a^{a^2} -\frac{dx}{(x+a)^2} + \frac{2}{a^2+a}$

15 If $I(a) = \int_a^{a^2} \log(ax)\, dx$, then the value of $\frac{dI}{da}$ is

a) $\int_a^{a^2} \frac{dx}{x} + 6a\log a - 2\log a$ b) $\int_a^{a^2} \frac{dx}{x} + 2a\log a - \log a$

c) $\int_a^{a^2} \frac{dx}{ax} + 6a\log a - 2\log a$ d) $\int_a^{a^2} \frac{dx}{x} + 6a\log a$

16 If $I(a) = \int_0^\infty \frac{e^{-x}-e^{-ax}}{x\sec x} dx$ and $I(a) = \frac{1}{2}\log(a^2+1) + c$ then the value of c is

a) $\log(1/\sqrt{2})$ b) $2\log 2$

c) $\log(\sqrt{2})$ d) $-\log 4$

17 If $f(x) = \int_0^x (x-t)^2 G(t)\, dt$ then $\frac{d^3 f}{dx^3}$ is

a) $G(x)$ b) 0

c) $x^2 G(x)$ d) $2G(x)$

18 If $I(a)=\int_0^\infty \frac{\tan^{-1}\left(\frac{x}{a}\right)-\tan^{-1}\left(\frac{x}{b}\right)}{x}dx$ and $I'(a)=-\frac{\pi}{2a}$ then $I(a)$ is

a) $\frac{\pi}{2}\log\left(\frac{b}{a}\right)$ b) $\frac{\pi}{2}\log\left(\frac{a}{b}\right)$

c) $2\tan^{-1}a$ d) $\tan^{-1}a-\tan^{-1}b$

19 If $\int_0^\pi \frac{dx}{a+b\cos x}=\frac{\pi}{a^2-b^2}$, $a>0,|b|<a$, then $\int_0^\pi \frac{dx}{(a+b\cos x)^2}$ is

a) $\frac{\pi}{\sqrt{a^2-b^2}}$ b) $\frac{\pi a}{(a^2-b^2)^{3/2}}$

c) $\frac{\pi b}{(a^2-b^2)^{3/2}}$ d) $\frac{-b\pi}{\sqrt{a^2-b^2}}$

20 If $\int_0^\pi \frac{dx}{a+b\cos x}=\frac{\pi}{a^2-b^2}$, $a>0,|b|<a$, then $\int_0^\pi \frac{\cos x\,dx}{(a+b\cos x)^2}$ is

a) $\frac{\pi}{\sqrt{a^2-b^2}}$ b) $\frac{\pi a}{(a^2-b^2)^{3/2}}$

c) $\frac{-b}{(a^2-b^2)^{3/2}}$ d) $\frac{-b\pi}{\sqrt{a^2-b^2}}$

Error Function

1 The definition of $\operatorname{erf}(\sqrt{t})$ is

a) $\frac{2}{\sqrt{\pi}}\int_0^t e^{-u^2}du$ b) $\frac{2}{\sqrt{\pi}}\int_t^\infty e^{-u^2}du$

c) $\frac{2}{\sqrt{\pi}}\int_0^{\sqrt{t}} e^{-u^2}du$ d) $\frac{2}{\sqrt{\pi}}\int_{\sqrt{t}}^\infty e^{-u^2}du$

2 The value of $\operatorname{erf}(\infty)$ is

a) 0 b) 1

c) ∞ d) -1

3 The value of $erfc(x)+erfc(-x)$ is

a) 1 b) 2

c) 0 d) -1

4 The value of $\int_0^t \operatorname{erf}(ax)\,dx+\int_0^t \operatorname{erfc}(ax)\,dx$ is

a) 1 b) 0

c) $2t$ d) t

5 The value of $\operatorname{erf}(-\infty)$ is

a) 0 b) 1

c) ∞ d) -1

6 Error function is

a) Even function b) Neither ever nor odd function

c) Odd function d) Constant function

7 The value of $erfc(0)$ is

a) 0 b) 1

c) -1 d) ∞

8 If $\frac{d}{dt}\left[\operatorname{erf}(\sqrt{t})\right]=\frac{e^{-t}}{\sqrt{\pi t}}$, then the value of $\int_0^\infty e^{-t}\operatorname{erf}(\sqrt{t})\,dt$ is

a) $\sqrt{2}$ b) 2

c) $1/\sqrt{2}$ d) $1/2$

9 If $\alpha(x)=\sqrt{\frac{2}{\pi}}\int_0^x e^{-t^2/2}dt$ then the value of $\alpha(x\sqrt{2})$ is

a) $\operatorname{erf}(x\sqrt{2})$ b) $-\operatorname{erf}(x)$

c) $\operatorname{erf}(2x)$ d) $\operatorname{erf}(x)$

10 The value of $\int_0^2 \operatorname{erf}\operatorname{c}(x)\,dx+\int_0^2 \operatorname{erfc}(-x)\,dx$ is

a) 0 b) 4

c) 2 d) -2

11 The value of $\frac{d}{dx}\operatorname{erf}(x)$ is

a) $\frac{2}{\sqrt{\pi}}e^{-tx^2}$ b) $\frac{2}{\sqrt{\pi}}e^{x^2}$

c) 0 d) $\frac{2}{\sqrt{\pi}}e^{-2x}$

12 The value of $\text{erf}(b) - \text{erf}(a)$ is

a) $\frac{2}{\sqrt{\pi}}\int_a^b e^{-t^2}dt$ b) $\int_a^b e^{-t^2}dt$

c) $\frac{2}{\sqrt{\pi}}\int_a^b e^{t^2}dt$ d) $\frac{2}{\sqrt{\pi\pi}}\int_b^a e^{-tt^2}dt\,dt$

13 The value of $\text{erf}(b) - \text{erf}(a)$ is

a) $\frac{1}{\sqrt{\pi}}\int_a^b e^{-t^2}\,dt$ b) $2\int_a^b e^{-t^2}\,dt$

c) $\int_a^b e^{-t^2}\,dt$ d) $\frac{2}{\sqrt{\pi}}\int_a^b e^{-t^2}\,dt$

14 The value of $erferfcc(\infty)$ is

a) 0 b) 1

c) -1 d) ∞

15 The value of $erfcerfc(-\infty)$ is

a) 0 b) 1

c) -1 d) 2

16 The value of $erf(\infty) + erfc(-\infty)$ is

a) 3 b) 2

c) 1 d) 0

17 The value of $erfc(x) + erfc(-x)$ is

a) 3 b) 2

c) 1 d) 0

18 The value of $\int_0^t 2t\,\text{erf}(t^2)dt + \int_0^t 2t\,\text{erfc}(t^2)\,dt$ is

a) 0 b) t

c) 1 d) t^2

Reduction Formulae									
01 - a)	02 - d)	03 - d)	04 - d)	05 - c)	06 - c)	07 - b)	08 - c)	09 - a)	10 - b)
11 - b)	12 - c)	13 - c)	14 - c)	15 - b)	16 - a)	17 - c)	18 - b)	19 - d)	20 - a)
21 - a)	22 - a)	23 - b)	24 - c)	25 - a)	26 - a)				
Beta and Gamma Function									
01 - b)	02 - d)	03 - a)	04 - a)	05 - a)	06 - b)	07 - c)	08 - d)	09 - a)	10 - c)
11 - d)	12 - a)	13 - d)	14 - d)	15 - a)	16 - c)	17 - b)	18 - a)	19 - a)	20 - c)
21 - b)	22 - b)	23 - c)	24 - a)	25 - c)					
Differentiation Under Integral Sign									
01 - a)	02 - c)	03 - a)	04 - a)	05 - a)	06 - d)	07 - c)	08 - d)	09 - c)	10 - a)
11 - d)	12 - b)	13 - a)	14 - c)	15 - a)	16 - a)	17 - d)	18 - a)	19 - b)	20 - c)
Error Function									
01 - c)	02 - b)	03 - b)	04 - d)	05 - d)	06 - a)	07 - b)	08 - c)	09 - d)	10 - b)
11 - a)	12 - a)	13 - d)	14 - a)	15 - d)	16 - a)	17 - b)	18 - d)		

Unit-IV

Curve Tracing

1 A point through which two branches of curve passes is called
a) Double point
b) Cusp
c) Node
d) Isolated point

2 A double point is Node if
a) Distinct branches have a common tangent
b) Distinct branches have distinct tangent
c) Tangent at double point is above the curve
d) Tangent at double point is below the curve

3 A double point is Cusp if
a) Two branches have distinct tangents
b) Tangent line cuts the curve unusually
c) Two branches have a common tangent
d) None of the above

4 If all powers of y are even in the equation then curve is symmetrical about
a) y −axis
b) line $y = x$
c) x −axis
d) line $y = -x$

5 If the equation of curve remains unchanged by replacing y by $-y$, then the curve is symmetric about
a) y −axis
b) line $y = x$
c) x −axis
d) line $y = -x$

6 If all terms of x are of even degree in the equation of curve, then the curve is symmetric about
a) y −axis
b) line $y = x$
c) x −axis
d) line $y = -x$

7 If the equation of curve remains unchanged by replacing x by $-x$, then the curve is symmetric about
a) y −axis
b) line $y = x$
c) x −axis
d) line $y = -x$

8 If the equation of curve remains unchanged by replacing x by $-y$ and y by $-x$, then the curve is symmetric about
a) y −axis
b) line $y = x$
c) x −axis
d) line $y = -x$

9 If the equation of curve does not contains any absolute constant term then the curve
a) Passes through origin
b) Is increasing
c) Does not pass through origin
d) Is decreasing

10 If the curve passes through origin then the tangent to the curve at origin is obtained by
a) Equating highest degree terms to zero
b) Equating odd degree terms to zero
c) Equating even degree terms to zero
d) Equating lowest degree terms to zero

11 The curve decreases strictly in the given interval if in that interval
a) $\frac{dy}{dx} < 0$
b) $\frac{dy}{dx} > 0$
c) $\frac{dy}{dx} = 0$
d) None of the above

12 Asymptotes are the tangents to the curve
a) At origin parallel to y −axis
b) At origin not parallel to co-ordinate axis
c) At origin parallel to x −axis
d) At infinity and are of the form $y = mx + c$

13 Asymptotes parallel to x −axis are obtained

by equating

a) Coefficient of highest degree terms of y in the equation to zero
b) Lowest degree terms to zero
c) Highest degree terms to zero
d) Coefficient of highest degree terms of x in the equation to zero

14 The parametric curve $x = f(t), y = g(t)$ is symmetric about x −axis if

a) $f(t)$ is even and $g(t)$ is an odd function of t
b) Both $f(t)$ and $g(t)$ are odd functions of t
c) $f(t)$ is an odd and $g(t)$ is even function of t
d) Both $f(t)$ and $g(t)$ are even functions of t

15 The curve $xy^2 = a^2(a - x)$ is symmetric about

a) x −axis
b) line $y = x$
c) y −axis
d) line $y = -x$

16 The curve $xy^2 = a^2(a - x)$

a) passes through the point $(-a, 0)$
b) does not pass through origin
c) passes through the origin
d) passes through the point (a, a)

17 In cartesian equation the points where $\frac{dy}{dx} = 0$, tangent to the curve at those points will be

a) parallel to $y-$axis
b) parallel to $y = x$
c) parallel to $x-$axis
d) parallel to $y = -x$

18 If the polar equation to the curve remains unchanged by changing θ to $-\theta$ then curve is symmetrical about

a) line $\theta = \frac{\pi}{4}$
b) line $\theta = \frac{\pi}{2}$
c) pole
d) initial line $\theta = 0$

19 If the polar equation to the curve remains unchanged by changing θ to $\pi - \theta$ then curve is symmetrical about

a) initial line $\theta = 0$
b) line passing through pole and perpendicular to initial line
c) pole
d) line $\theta = \frac{\pi}{4}$

20 For the rose curve $r = a\cos n\theta$ and $r = a\sin n\theta$ if n is odd then the curve consist of

a) $2n$ equal loops
b) $(n-1)$ equal loops
c) $(n+1)$ equal loops
d) n equal loops

21 The curve represented by the equation $x^2y^2 = x^2 + 1$ is symmetrical about

a) $y = -x$
b) both x and y axes
c) $x-$axis only
d) $y = x$

22 The curve represented by the equation $r^2\theta = a^2$ is symmetrical about

a) pole
b) line $\theta = \frac{\pi}{2}$
c) Initial line $\theta = 0$
d) line $\theta = \frac{\pi}{4}$

23 For the polar curve, angle ϕ between radius vector and tangent line is obtained by the formula

a) $\cot\phi = r\frac{d\theta}{dr}$
b) $\tan\phi = r\frac{dr}{d\theta}$
c) $\tan\phi = r\frac{d\theta}{dr}$
d) $\sin\phi = r\frac{d\theta}{dr}$

24 The equation of asymptotes parallel to y-axis to the curve represented by the equation $y^2(4 - x) = x(x - 2)^2$ is

a) $x = 2$
b) $y = 0$
c) $x = 4$
d) $x = 0$

25 The curve represented by the equation $x = at^2,\ y = 2at$ is symmetrical about

a) $y-$axis
b) both x and y axes
c) $x-$axis
d) opposite quadrants

26 The region of absence for the curve represented by the equation $xy^2 = a^2(a-x)$ is

a) $x > 0$ and $x < a$ b) $x < 0$ and $x < a$

c) $x < 0$ and $x > a$ d) $x > 0$ and $x > a$

27 The region of absence for the curve represented by the equation $y^2 = \frac{x^2(a-x)}{a+x}$ is

a) $x > a$ and $x > -a$ b) $x < a$ and $x < -a$

c) $x < a$ and $x > -a$ d) $x > a$ and $x < -a$

28 The equation of tangent to the curve at origin represented by the equation $y(1+x^2) = x$ is

a) $y = x$ b) $x = 0$

c) $x = \pm 1$ d) $y = 0$

29 The region of presence for the curve represented by the equation $y^2(6-x) = x^3$ is

a) $x > 6$ b) $x < -6$

c) $0 < x < 6$ d) $x > 6$ and $x < 0$

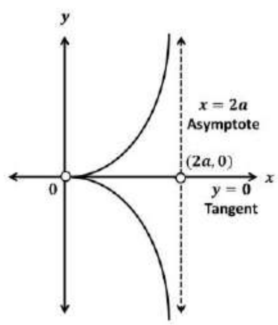
30 The region of presence for the curve represented by the equation $y^2(x-a) = x^2(2a-x)$ is

a) $x > a$ b) $x < a$

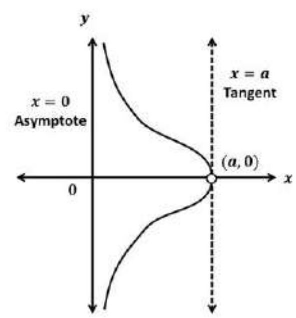
c) $0 < x < a$ d) $0 < x < 2a$

31 The equation $y^2(2a-x) = x^3$ represents the curve

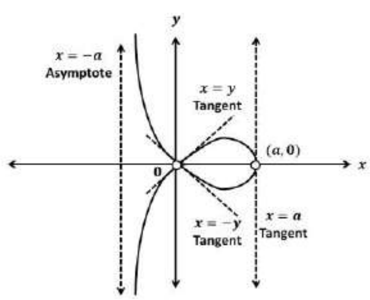
a)



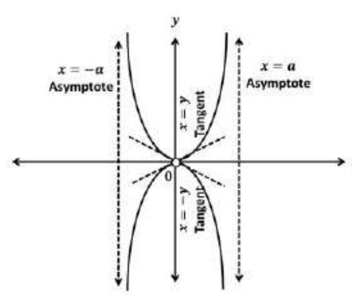
b)



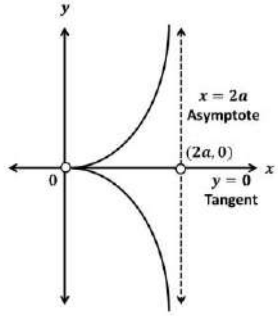
c)

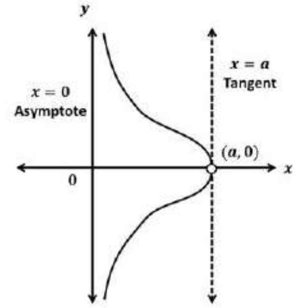


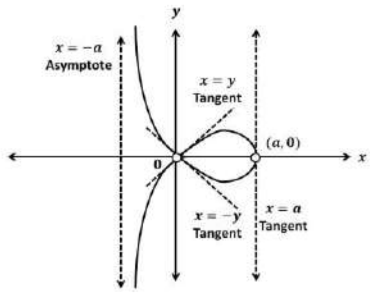
d)

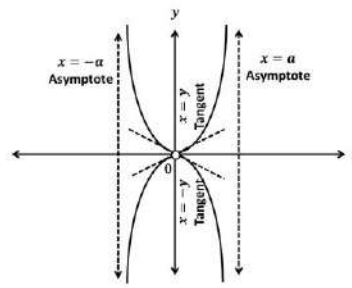


32 The equation $x(x^2+y^2) = a(x^2-y^2)$ represents the curve

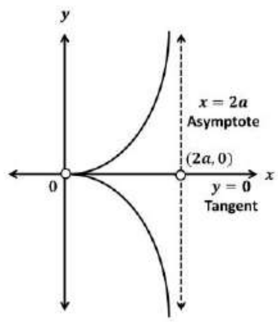
a) 

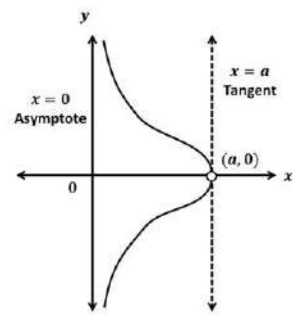
b) 

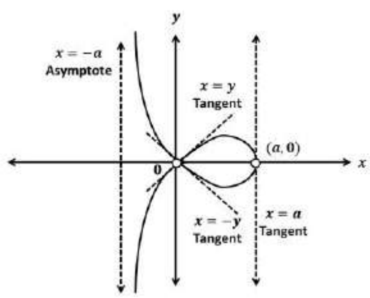
c) 

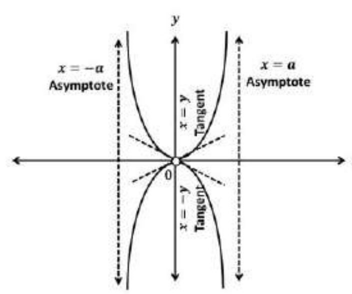
d) 

33 The equation $xy^2 = a^2(a - x)$ represents the curve

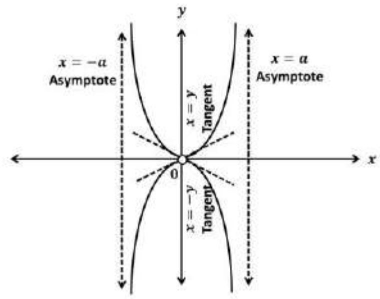
a) 

b) 

c) 

d) 

34 The equation of curve represented in the following figure is



a) $xy^2 = a^2(a-x)$ b) $y^2(2a-x) = x^3$
c) $x(x^2+y^2) = a(x^2-y^2)$ d) $x^2y^2 = a^2(y^2-x^2)$

Rectification of curve

1 The formula to find the length of the curve $y = f(x)$ from $x = a$ to $x = b$ is $s =$

a) $\int_a^b \sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dx$ b) $\int_a^b \sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dy$
c) $\int_a^b \sqrt{a^2+\left(\frac{dy}{dx}\right)^2}\,dx$ d) $\int_a^b \sqrt{a^2+b^2\left(\frac{dy}{dx}\right)^2}\,dy$

2 The formula to find the length of the curve $x = f(y)$ from $y = a$ to $y = b$ is $S =$

a) $\int_a^b \sqrt{1+\left(\frac{dx}{dy}\right)^2}\,dx$ b) $\int_a^b \sqrt{1+\left(\frac{dx}{dy}\right)^2}\,dy$
c) $\int_a^b \sqrt{a^2+\left(\frac{dx}{dy}\right)^2}\,dx$ d) $\int_a^b \sqrt{a^2+b^2\left(\frac{dx}{dy}\right)^2}\,dy$

3 The formula to find the length of the curve $x = f(t),\ y = g(t)$ from $t = t_1$ to $t = t_2$ is

a) $\int_{t_1}^{t_2} \sqrt{\frac{dx}{dt}+\frac{dy}{dt}}\,dt$ b) $\int_{t_1}^{t_2} \sqrt{\left(\frac{dx}{dt}\right)^2+\left(\frac{dy}{dt}\right)^2}\,dt$
c) $\int_{t_2}^{t_1} \sqrt{\left(\frac{dx}{dt}\right)^2+\left(\frac{dy}{dt}\right)^2}\,dt$ d) $\int_{t_1}^{t_2} \sqrt{\left(\frac{dx}{dt}\right)^2+\left(\frac{dy}{dt}\right)^2}\,dx$

4 The formula to find the length of the curve $r = f(\theta)$ from $\theta = \theta_1$ to $\theta = \theta_2$ is

a) $\int_{\theta_1}^{\theta_2} \sqrt{1+\left(\frac{dr}{d\theta}\right)^2}\,d\theta$ b) $\int_{\theta_1}^{\theta_2} \sqrt{r^2+\left(\frac{dr}{d\theta}\right)^2}\,d\theta$
c) $\int_{\theta_1}^{\theta_2} \sqrt{r^2+\left(\frac{dr}{d\theta}\right)^2}\,dr$ d) $\int_{\theta_2}^{\theta_1} \sqrt{r^2+\left(\frac{dr}{d\theta}\right)^2}\,d\theta$

5 The formula to find the length of the curve $\theta = f(r)$ from $r = r_1$ to $r = r_2$ is

a) $\int_{r_1}^{r_2} \sqrt{r^2+\left(\frac{d\theta}{dr}\right)^2}\,dr$ b) $\int_{r_1}^{r_2} \sqrt{r^2+\left(\frac{d\theta}{dr}\right)^2}\,d\theta$
c) $\int_{r_1}^{r_2} \sqrt{1+r^2\left(\frac{d\theta}{dr}\right)^2}\,dr$ d) $\int_{r_2}^{r_1} \sqrt{r^2+\left(\frac{d\theta}{dr}\right)^2}\,d\theta$

6 The length of arc of the curve $y = a\cosh(x/a)$, from vertex (0,0) to any point (x, y) using $1 + \left(\frac{dy}{dx}\right)^2 = \cosh^2\frac{x}{a}$ is

a) $a\cosh(x/a)$ b) $\sinh(x/a)$
c) $a\sinh(x/a)$ d) $\cosh(x/a)$

7 The length of arc of upper part of loop of the curve $3y^2 = x(x-1)^2$ from (0,0) to (1,0) using $1 + \left(\frac{dy}{dx}\right)^2 = \frac{(3x+1)^2}{12x}$, is

a) $4/\sqrt{3}$ b) $1/\sqrt{3}$
c) $\sqrt{3}$ d) $2/\sqrt{3}$

8 The length of upper half of the cardioide $r = a(1+\cos\theta)$ where θ varies from 0 to π using $r^2 + \left(\frac{dr}{d\theta}\right)^2 = 2a^2(1+\cos\theta)$ is

a)	a	b)	$2a$
c)	$4a$	d)	$8a$

9 Integral for calculating the length of arc of parabola $y^2 = 4x$, cut off by the line $3y = 8$ is

a)	$\int_0^{16/9} \sqrt{1+\left(\frac{dy}{dx}\right)^2}\, dx$	b)	$\int_0^{9/16} \sqrt{1+\left(\frac{dy}{dx}\right)^2}\, dx$
c)	$\int_0^{8/3} \sqrt{1+\left(\frac{dy}{dx}\right)^2}\, dx$	d)	$\int_0^{3/8} \sqrt{1+\left(\frac{dy}{dx}\right)^2}\, dx$

10 The length of arc of the curve $x = e^\theta\cos\theta, y = e^\theta\sin\theta$, from $\theta = 0$ to $\theta = \pi/2$, using $\left(\frac{dx}{d\theta}\right)^2 + \left(\frac{dy}{d\theta}\right)^2 = 2e^{2\theta}$ is

a)	$\sqrt{2}e^{\pi/2}$	b)	$\sqrt{2}(e^{\frac{\pi}{2}}+1)$
c)	$\sqrt{2}(e^{\frac{\pi}{2}}-1)$	d)	$(e^{\frac{\pi}{2}}-1)$

11 For the astroid $x^{2/3} + y^{2/3} = a^{2/3}$ the expression for $\left(\frac{dx}{d\theta}\right)^2 + \left(\frac{dy}{d\theta}\right)^2$ is

a)	$3a^2\sin^2\theta\cos^2\theta$	b)	$3a\sin^2\theta\cos^2\theta$
c)	$3\,a\sin\theta\cos\theta$	d)	$9a^2\sin^2\theta\cos^2\theta$

12 For the curve $ay^2 = x^3$, the expression for $1 + \left(\frac{dy}{dx}\right)^2$ is

a)	$9x/4a$	b)	$1-(9x/4a)$
c)	$1+(9x/4a)$	d)	$4a+9x$

13 To find total length of the curve $9y^2 = (x+7)(x+4)^2$ the limits of the integration for x are

a)	$4\ to\ 7$	b)	$-4\ \ to\ 7$
c)	$-4\ \ to\ -7$	d)	$4\ \ to\ -7$

14 The total length of the loop of the curve $x = t^2$, $y = t\left(1-\frac{t^2}{3}\right)$ if $ds^2 = (1+t^2)^2$ and $0 < t < \sqrt{3}$ is

a)	4	b)	$4\sqrt{3}$
c)	$\sqrt{3}$	d)	$4+\sqrt{3}$

15 The limits of θ for finding the perimeter of $r = a(1+\cos\theta)$ are

a)	$0<\theta<\pi$	b)	$0<\theta<2\pi$
c)	$0<\theta<\pi/2$	d)	$0<\theta<\pi/4$

Curve Tracing									
01 - a)	02 - b)	03 - c)	04 - c)	05 - c)	06 - a)	07 - a)	08 - d)	09 - a)	10 - d)
11 - a)	12 - d)	13 - d)	14 - a)	15 - a)	16 - b)	17 - c)	18 - d)	19 - b)	20 - d)
21 - b)	22 - a)	23 - c)	24 - c)	25 - c)	26 - c)	27 - d)	28 - a)	29 - c)	30 - d)
31 - a)	32 - c)	33 - b)	34 - d)						
Rectification of Curves									
01 - a)	02 - b)	03 - b)	04 - b)	05 - c)	06 - c)	07 - d)	08 - c)	09 - a)	10 - c)
11 - d)	12 - c)	13 - c)	14 - b)	15 - b)					

UNIT V

Solid Geometry

((MARKS)) QUESTION IS OF HOW MANY MARKS? (1 OR 2 OR 3 UPTO 10)	1
((QUESTION)) ENTER CONTENT. QTN CAN HAVE IMAGES ALSO	The center & radius of the sphere $x^2+y^2+z^2-2x+4y-4z=0$ are
((OPTION_A)) THIS IS MANDATORY OPTION	$C=(1,-2,2),\ r=3$
((OPTION_B)) THIS IS ALSO MANDATORY OPTION	$C=(1,2,2),\ r=3$
((OPTION_C)) This is optional	$C=(1,-2,2),\ r=2$
((OPTION_D)) This is optional	$C=(-1,-2,-2),\ r=2$
((OPTION_E)) This is optional. If optional keep empty so that system will skip this option	
((CORRECT_CHOICE)) Either A or B or C or D or E	A
((EXPLANATION)) This is also optional	

((MARKS)) QUESTION IS OF HOW MANY MARKS? (1 OR 2 OR 3 UPTO 10)	1
((QUESTION)) ENTER CONTENT. QTN CAN HAVE IMAGES ALSO	The center & radius of the sphere $x^2+y^2+z^2+10x+2z+10=0$ are
((OPTION_A)) THIS IS MANDATORY OPTION	$C=(-5,\,-1,\,-1),\;\; r=5$
((OPTION_B)) THIS IS ALSO MANDATORY OPTION	$C=(5,\,0,\,1),\;\; r=5$
((OPTION_C)) This is optional	$C=(-5,\,0,\,-1),\;\; r=4$
((OPTION_D)) This is optional	$C=(5,\,0,\,-1),\;\; r=4$
((OPTION_E)) This is optional. If optional keep empty so that system will skip this option	
((CORRECT_CHOICE)) Either A or B or C or D or E	C
((EXPLANATION)) This is also optional	

((MARKS)) QUESTION IS OF HOW MANY MARKS? (1 OR 2 OR 3 UPTO 10)	1
((QUESTION)) ENTER CONTENT. QTN CAN HAVE IMAGES ALSO	The plane $4x-3y+6z-35=0$ is tangential to the sphere $x^2+y^2+z^2-y-2z-14=0$. Then the perpendicular distance between the center & the plane is
((OPTION_A)) THIS IS MANDATORY OPTION	$\frac{\sqrt{61}}{3}$
((OPTION_B)) THIS IS ALSO MANDATORY OPTION	$\frac{\sqrt{61}}{2}$
((OPTION_C)) This is optional	$\frac{61}{4}$
((OPTION_D)) This is optional	$\frac{61}{2}$
((OPTION_E)) This is optional. If optional keep empty so that system will skip this option	
((CORRECT_CHOICE)) Either A or B or C or D or E	B
((EXPLANATION)) This is also optional	

((MARKS)) QUESTION IS OF HOW MANY MARKS? (1 OR 2 OR 3 UPTO 10)	1
((QUESTION)) ENTER CONTENT. QTN CAN HAVE IMAGES ALSO	If the plane $ax+by+cz+d=0$ is tangential to the sphere $x^2+y^2+z^2+2gx+2fy+2hz+c=0$, then the perpendicular distance between the center & the plane is equal to
((OPTION_A)) THIS IS MANDATORY OPTION	$p=\sqrt{g^2+f^2+h^2}$
((OPTION_B)) THIS IS ALSO MANDATORY OPTION	the perimeter of the sphere
((OPTION_C)) This is optional	the diameter of the sphere
((OPTION_D)) This is optional	the radius of the sphere
((OPTION_E)) This is optional. If optional keep empty so that system will skip this option	
((CORRECT_CHOICE)) Either A or B or C or D or E	D
((EXPLANATION)) This is also optional	

((MARKS)) QUESTION IS OF HOW MANY MARKS? (1 OR 2 OR 3 UPTO 10)	1
((QUESTION)) ENTER CONTENT. QTN CAN HAVE IMAGES ALSO	If a plane is touching at point $(1,\ 2,\ 0)$ to a sphere whose center is at $(1,\ 2,\ -2)$, then the radius of the sphere is equal to
((OPTION_A)) THIS IS MANDATORY OPTION	4
((OPTION_B)) THIS IS ALSO MANDATORY OPTION	3
((OPTION_C)) This is optional	2
((OPTION_D)) This is optional	1
((OPTION_E)) This is optional. If optional keep empty so that system will skip this option	
((CORRECT_CHOICE)) Either A or B or C or D or E	C
((EXPLANATION)) This is also optional	

((MARKS)) QUESTION IS OF HOW MANY MARKS? (1 OR 2 OR 3 UPTO 10)	1
((QUESTION)) ENTER CONTENT. QTN CAN HAVE IMAGES ALSO	If a plane is touching at point $(1,\ -2,\ 1)$ to a sphere whose center is at $(1,\ 2,\ -2)$, then the perpendicular distance between the plane and the sphere is equal to
((OPTION_A)) THIS IS MANDATORY OPTION	$\frac{5}{2}$
((OPTION_B)) THIS IS ALSO MANDATORY OPTION	5
((OPTION_C)) This is optional	4
((OPTION_D)) This is optional	2
((OPTION_E)) This is optional. If optional keep empty so that system will skip this option	
((CORRECT_CHOICE)) Either A or B or C or D or E	B
((EXPLANATION)) This is also optional	

((MARKS)) QUESTION IS OF HOW MANY MARKS? (1 OR 2 OR 3 UPTO 10)	1
((QUESTION)) ENTER CONTENT. QTN CAN HAVE IMAGES ALSO	If a plane is touching at point $(1,\ -2,\ -2)$ to a sphere whose center is at the origin, then the perpendicular distance between the plane and the sphere is equal to
((OPTION_A)) THIS IS MANDATORY OPTION	1
((OPTION_B)) THIS IS ALSO MANDATORY OPTION	2
((OPTION_C)) This is optional	3
((OPTION_D)) This is optional	4
((OPTION_E)) This is optional. If optional keep empty so that system will skip this option	
((CORRECT_CHOICE)) Either A or B or C or D or E	C
((EXPLANATION)) This is also optional	

((MARKS)) QUESTION IS OF HOW MANY MARKS? (1 OR 2 OR 3 UPTO 10)	1
((QUESTION)) ENTER CONTENT. QTN CAN HAVE IMAGES ALSO	If a plane $x+y+z=0$ is passing through the sphere $x^2+y^2+z^2=4$, then the center and radius of the circle: $x^2+y^2+z^2=4,\ x+y+z=0$ is given by
((OPTION_A)) THIS IS MANDATORY OPTION	$C=(0,\ 0,\ 0),\ r=2$
((OPTION_B)) THIS IS ALSO MANDATORY OPTION	$C=(0,\ 1,\ 0),\ r=2$
((OPTION_C)) This is optional	$C=(1,\ 0,\ 0),\ r=2$
((OPTION_D)) This is optional	$C=(1,\ 1,\ 1),\ r=3$
((OPTION_E)) This is optional. If optional keep empty so that system will skip this option	
((CORRECT_CHOICE)) Either A or B or C or D or E	A
((EXPLANATION)) This is also optional	

((MARKS)) QUESTION IS OF HOW MANY MARKS? (1 OR 2 OR 3 UPTO 10)	1
((QUESTION)) ENTER CONTENT. QTN CAN HAVE IMAGES ALSO	The center and radius of the circle which is obtained by a plane is passing through the center $(1,\ -1,\ 3)$ of the sphere whose radius is $r=2$, are given by
((OPTION_A)) THIS IS MANDATORY OPTION	$C=(-1,\ -1,\ -3),\ r=3$
((OPTION_B)) THIS IS ALSO MANDATORY OPTION	$C=(1,\ 1,\ -3),\ r=2$
((OPTION_C)) This is optional	$C=(1,\ -1,\ 3),\ r=3$
((OPTION_D)) This is optional	$C=(1,\ -1,\ 3),\ r=2$
((OPTION_E)) This is optional. If optional keep empty so that system will skip this option	
((CORRECT_CHOICE)) Either A or B or C or D or E	D
((EXPLANATION)) This is also optional	

((MARKS)) QUESTION IS OF HOW MANY MARKS? (1 OR 2 OR 3 UPTO 10)	1
((QUESTION)) ENTER CONTENT. QTN CAN HAVE IMAGES ALSO	The center and radius of the circle which is obtained by a plane is passing through the center $\left(1,\ \sqrt{2},\ \sqrt{3}\right)$ of the sphere whose radius is $r=\sqrt{2}$, are given by
((OPTION_A)) THIS IS MANDATORY OPTION	$C=\left(1,\ 2,\ 3\right),\quad r=2$
((OPTION_B)) THIS IS ALSO MANDATORY OPTION	$C=\left(1,\ \sqrt{2},\ \sqrt{3}\right),\quad r=\sqrt{2}$
((OPTION_C)) This is optional	$C=\left(1,\ \sqrt{2},\ \sqrt{3}\right),\quad r=\sqrt{14}$
((OPTION_D)) This is optional	none of the above
((OPTION_E)) This is optional. If optional keep empty so that system will skip this option	
((CORRECT_CHOICE)) Either A or B or C or D or E	B
((EXPLANATION)) This is also optional	

((MARKS)) QUESTION IS OF HOW MANY MARKS? (1 OR 2 OR 3 UPTO 10)	1
((QUESTION)) ENTER CONTENT. QTN CAN HAVE IMAGES ALSO	The equation of the sphere passing through the circle $x^2+y^2+z^2-2x-11=0,\ x+y-z=3$ is obtained by
((OPTION_A)) THIS IS MANDATORY OPTION	$x^2+y^2+z^2-2x-11+k(x+y-z-3)=0$
((OPTION_B)) THIS IS ALSO MANDATORY OPTION	$x^2+y^2+z^2-2x+k(x+y-z)=0$
((OPTION_C)) This is optional	$x^2+y^2+z^2+k(x+y-z)=0$
((OPTION_D)) This is optional	none of the above
((OPTION_E)) This is optional. If optional keep empty so that system will skip this option	
((CORRECT_CHOICE)) Either A or B or C or D or E	A
((EXPLANATION)) This is also optional	

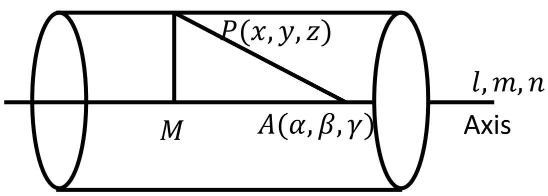
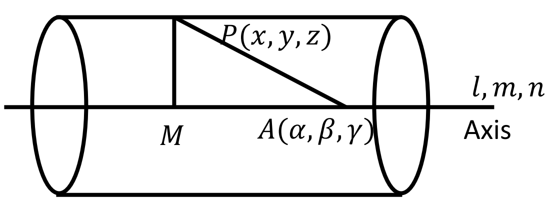
((MARKS)) QUESTION IS OF HOW MANY MARKS? (1 OR 2 OR 3 UPTO 10)	1
((QUESTION)) ENTER CONTENT. QTN CAN HAVE IMAGES ALSO	The equation of the sphere passing through the circle $x^2+y^2+z^2-2x+2y-11=0,\ x+y-z=11$ is obtained by
((OPTION_A)) THIS IS MANDATORY OPTION	$x^2+y^2+z^2-2x+2y-11+k\left(x+y-z+11\right)=0$
((OPTION_B)) THIS IS ALSO MANDATORY OPTION	$x^2+y^2+z^2-2x+2y+k\left(x+y-z\right)=0$
((OPTION_C)) This is optional	$x^2+y^2+z^2-2x+2y-11+k\left(x+y-z-11\right)=0$
((OPTION_D)) This is optional	none of the above
((OPTION_E)) This is optional. If optional keep empty so that system will skip this option	
((CORRECT_CHOICE)) Either A or B or C or D or E	C
((EXPLANATION)) This is also optional	

((MARKS)) QUESTION IS OF HOW MANY MARKS? (1 OR 2 OR 3 UPTO 10)	1
((QUESTION)) ENTER CONTENT. QTN CAN HAVE IMAGES ALSO	The equation of the sphere passing through the circle $x^2+y^2+z^2-2x+2y-11=0,\ x^2+y^2+z^2+2x-2y+z=0$ is obtained by
((OPTION_A)) THIS IS MANDATORY OPTION	$x^2+y^2+z^2-2x+2y+k\left(x^2+y^2+z^2+2x-2y+z\right)=0$
((OPTION_B)) THIS IS ALSO MANDATORY OPTION	$x^2+y^2+z^2-2x+2y-11+k\left(x^2+y^2+z^2+2x-2y+z\right)=0$
((OPTION_C)) This is optional	$x^2+y^2+z^2+k\left(x^2+y^2+z^2\right)=0$
((OPTION_D)) This is optional	$-2x+2y-11+k\left(2x-2y+z\right)=0$
((OPTION_E)) This is optional. If optional keep empty so that system will skip this option	
((CORRECT_CHOICE)) Either A or B or C or D or E	B
((EXPLANATION)) This is also optional	

Cone and cylinder

Q. 1	Let L be any line making an angle α, β, γ with x, y and z axis respectively. Then direction cosines (dc's) of L are				[01]
	A)	$l = \sin\alpha, m = \sin\beta, n = \sin\gamma$	C)	$l = \sec\alpha, m = \sec\beta, n = \sec\gamma$	
	B)	$l = \tan\alpha, m = \tan\beta, n = \tan\gamma$	D)	$l = \cos\alpha, m = \cos\beta, n = \cos\gamma$	
Ans.	D				
Q. 2	Let L be any line with l, m, n are direction cosines (dc's) of L. And a, b, c are direction ratios (dr's) of L Then l, m, n are.				[01]
	A)	$l = -\frac{a}{\sqrt{a^2+b^2+c^2}}, m = \frac{b}{\sqrt{a^2+b^2+c^2}}, n = \frac{c}{\sqrt{a^2+b^2+c^2}}$	C)	$l = -\frac{a}{\sqrt{a^2+b^2+c^2}}, m = -\frac{b}{\sqrt{a^2+b^2+c^2}}, n = \frac{c}{\sqrt{a^2+b^2+c^2}}$	
	B)	$l = \frac{a}{\sqrt{a^2+b^2+c^2}}, m = \frac{b}{\sqrt{a^2+b^2+c^2}}, n = \frac{c}{\sqrt{a^2+b^2+c^2}}$	D)	$l = -\frac{a}{\sqrt{a^2+b^2+c^2}}, m = -\frac{b}{\sqrt{a^2+b^2+c^2}}, n = -\frac{c}{\sqrt{a^2+b^2+c^2}}$	
Ans.	C				
Q. 3	Equation of straight line passing through $P(x_1, y_1, z_1)$ and $Q(x_2, y_2, z_2)$ is				[01]
	A)	$\frac{x-x_1}{x_2-x_1} = \frac{y-y_1}{y_2-y_1} = \frac{z-z_1}{z_2-z_1}$	C)	$\frac{z_2-z_1}{x_2-x_1} = \frac{z_2-z_1}{y_2-y_1} = \frac{z-z_1}{z_2-z_1}$	
	B)	$\frac{y_2-y_1}{x_2-x_1} = \frac{y-y_1}{y_2-y_1} = \frac{y_2-y_1}{z_2-z_1}$	D)	$\frac{x-x_1}{x_2-x_1} = \frac{x_2-x_1}{y_2-y_1} = \frac{x_2-x_1}{z_2-z_1}$	
Ans.	A				

Q. 4	Equation of straight line passing through $P(x_1, y_1, z_1)$ and having dcs $l,\ m,\ n$ is				[01]
	A)	$\frac{x+x_1}{l}=\frac{y+y_1}{m}=\frac{z+z_1}{n}=r$	C)	$\frac{x-x_1}{l}=\frac{y-y_1}{m}=\frac{z-z_1}{n}=r$	
	B)	$\frac{x-x_1}{l}=\frac{y+y_1}{m}=\frac{z-z_1}{n}=r$	D)	$\frac{x+x_1}{l}=\frac{y-y_1}{m}=\frac{z+z_1}{n}=r$	
Ans.	C				
Q. 5	Equation of straight line passing through $P(x_1, y_1, z_1)$ and having drs $a,\ b,\ c$ is				[01]
	A)	$\frac{x-x_1}{a}=\frac{y-y_1}{b}=\frac{z-z_1}{c}=k$	C)	$\frac{x-x_1}{a}=\frac{y+y_1}{b}=\frac{z+z_1}{c}=k$	
	B)	$\frac{x+x_1}{a}=\frac{y+y_1}{b}=\frac{z+z_1}{c}=k$	D)	$\frac{x+x_1}{a}=\frac{y-y_1}{b}=\frac{z+z_1}{c}=k$	
Ans.	A				
Q. 6	Perpendicular distance of a point $P(x_1, y_1, z_1)$ from a plane $ax+by+cz+d=0$ is given by				[01]
	A)	$\left\lvert\frac{ax_1+by_1+cz_1+d}{\sqrt{a^2+b^2+c^2}}\right\rvert$	C)	$\left\lvert\frac{ax_1+by_1+cz_1+d}{\sqrt{x_1^2+y_1^2+z_1^2}}\right\rvert$	
	B)	$\left\lvert\frac{ax_1+by_1+cz_1+d}{\sqrt{a^2+b^2+c^2+d^2}}\right\rvert$	D)	None of these	
Ans.	C				
Q. 7	The general equation of cone is				[01]
	A)	$ax^2+by^2+cz^2-2hxy-2fyz-2gzx$ $+2ux+2vy+2wz+d=0$	C)	$ax^2+by^2+cz^2+2hxy+2fyz$ $+2gzx-2ux-2vy$ $-2wz-d=0$	
	B)	$ax^2+by^2+cz^2+2hxy+2fyz+2gzx$ $+2ux+2vy+2wz+d=0$	D)	None of these.	
Ans.	B				
Q. 8	The equation of cone with vertex at origin is				[01]
	A)	$ax^2+by^2+cz^2+2hxy+2fyz+2gzx=0$	C)	$ax^2+by^2+cz^2=0$	
	B)	$ax^2+by^2+cz^2-2hxy-2fyz-2gzx=0$	D)	$ax^2-by^2-cz^2+2hxy+2fyz$ $+2gzx=0$	

Ans.	A				
Q. 9	The equation of right circular cone is				[01]
	A)	$\cos\theta = \frac{l(x+\alpha)+m(y+\beta)+n(z+\gamma)}{\sqrt{l^2+m^2+n^2}\sqrt{(x+\alpha)^2+(y+\beta)^2+(z+\gamma)^2}}$	C)	$\cos\theta = \frac{l(x-\alpha)-m(y-\beta)-n(z-\gamma)}{\sqrt{l^2-m^2-n^2}\sqrt{(x-\alpha)^2+(y-\beta)^2+(z-\gamma)^2}}$	
	B)	$\cos\theta = \frac{l(x-\alpha)+m(y-\beta)+n(z-\gamma)}{\sqrt{l^2+m^2+n^2}\sqrt{(x-\alpha)^2+(y-\beta)^2+(z-\gamma)^2}}$	D)	$\cos\theta = \frac{l(x-\alpha)+m(y+\beta)+n(z-\gamma)}{\sqrt{l^2+m^2+n^2}\sqrt{(x-\alpha)^2+(y+\beta)^2+(z-\gamma)^2}}$	
Ans.	B				
Q.10	The equation of right circular cylinder whose radius is r and axis is the line $\frac{x-\alpha}{l}=\frac{y-\beta}{m}=\frac{z-\gamma}{n}$.  				[01]
	A)	$PA^2+PM^2=AM^2$	C)	$PA^2=-PM^2-AM^2$	
	B)	$PA^2=PM^2-AM^2$	D)	$PA^2=PM^2+AM^2$	
Ans.	D				
Q.11	The equation of right circular cylinder whose radius is r and axis is the line $\frac{x-\alpha}{l}=\frac{y-\beta}{m}=\frac{z-\gamma}{n}$. Is $PA^2=PM^2+AM^2$,$AM = Projection\ of\ PA\ on\ axis$ is given by  				
	A)	$\frac{l(x+\alpha)+m(y+\beta)+n(z+\gamma)}{\sqrt{l^2+m^2+n^2}}$	C)	$\frac{l(x-\alpha)+m(y-\beta)+n(z-\gamma)}{\sqrt{l^2-m^2-n^2}}$	
	B)	$\frac{l(x-\alpha)+m(y-\beta)+n(z-\gamma)}{\sqrt{l^2+m^2+n^2}}$	D)	$\frac{l(x-\alpha)-m(y-\beta)-n(z-\gamma)}{\sqrt{l^2-m^2-n^2}}$	
Ans.	B				

Q.12	The right circular cone which passes through the point $(2,-2,1)$ with vertex at the origin and axis parallel to the line $\frac{x-2}{5}=\frac{y-1}{1}=\frac{z+2}{1}$ Then the value of semi-vertical angle θ is				[01]
	A)	$\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$	C)	$\cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$	
	B)	$-\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$	D)	$\cos^{-1}\left(\frac{1}{\sqrt{5}}\right)$	
Ans.	A				
Q.13	The equation of right circular cylinder of radius 2, whose axis is the line $\frac{x-1}{2}=\frac{y-2}{1}=\frac{z-3}{2}$ is $PA^2=PM^2+AM^2$ Then $AM=Proj^n\ of\ PA\ on\ axis$ is given by				[01]
	A)	$AM=\frac{2(x+1)+1(y+2)+2(z+3)}{\sqrt{2^2+1^2+2^2}}$	C)	$AM=\frac{2(x-1)+1(y-2)+2(z-3)}{\sqrt{2^2+1^2+2^2}}$	
	B)	$AM=\frac{2(x-1)+1(y-2)+2(z-3)}{\sqrt{2^2-1^2-2^2}}$	D)	$AM=\frac{2(x-1)-1(y-2)+2(z-3)}{\sqrt{2^2-1^2+2^2}}$	
Ans.	C				

SINHGAD COLLEGE OF ENGINEERING, PUNE

ENGINEERING MATHEMATICS-II

UNIT 6- TRIPLE INTEGRTION MCQ

1	Transformation of triple integration to spherical polar coordinates is $a)$ $\iiint_V F(r,\theta,\emptyset)r^2 sin\theta d\theta d\emptyset dr$ b) $\iiint_V F(r,\theta,z)r^2 sin\theta d\theta d\emptyset dr$ c) $\iiint_V F(r,\theta,\emptyset)sin\theta d\theta d\emptyset dr$ d) $\iiint_V F(r,\theta,\emptyset)r^2 d\theta d\emptyset dr$	a
2	$\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x+y+z)dxdydz =$ a)1 b) 0 3) -1 4) none of these	b
3	$\int_{0}^{1}\int_{y^2}^{1}\int_{0}^{1-x} xdxdydz$ a)$\frac{-4}{35}$ b) $\frac{4}{35}$ c) $\frac{2}{35}$ d) $\frac{-2}{35}$	b
4	$\iiint(x^2y^2+y^2z^2+z^2x^2)dxdydz$ throughout the volume of the sphere $x^2+y^2+z^2=a^2$ is a) $\frac{4}{35}a^7$ b) $\frac{-4}{35}a^7\pi$ c) $\frac{4}{35}a^7\pi$ d) $a^7\pi$	c
5	$\iiint_V\sqrt{1-\frac{x^2}{a^2}-\frac{y^2}{b^2}-\frac{z^2}{c^2}}dxdydz$ throughout the volume of the ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ is a)$\frac{\pi^2abc}{4}$ b) $\frac{\pi abc}{4}$ c) $\frac{abc}{4}$ d) $\frac{\pi^2}{4}$	a
6	$\int_{0}^{1}\int_{0}^{1-x}\int_{0}^{x-y} e^z dxdydz =$	c

	a) $\frac{1}{2}$ b) $-\frac{1}{2}$ c) $\frac{1}{4}$ d) $-\frac{1}{4}$	
7	$\int_0^a\int_0^x\int_0^{\sqrt{x+y}} zdxdydz =$ a)$-\frac{a^2}{4}$ b) $\frac{a}{4}$ c) $\frac{a^3}{4}$ d) $\frac{a^2}{4}$	c
8	$\iiint (x+y+z)dxdydz$ over the positive octant of the sphere $x^2+y^2+z^2=a^2$ is a) $\frac{-\pi a^4}{16}$ b) $\frac{3\pi a^4}{16}$ c) $\frac{3\pi a^2}{16}$ d) $\frac{\pi a^4}{6}$	b
9	$\iiint \frac{z^2}{x^2+y^2+z^2}dxdydz$ over the volume bounded by $x^2+y^2+z^2=z$ is a) $\frac{\pi a^4}{6}$ b) $\frac{\pi}{3}$ c) $\frac{\pi}{6}$ d) $-\frac{\pi}{6}$	b
10	The Dirichlet's theorem for 3 variables x,y,z is $\iiint x^{a-1}y^{b-1}z^{c-1}dxdydz =$ a) $\frac{\Gamma a\,\Gamma b\,\Gamma c}{\Gamma(1+a-b+c)}$ b) $\frac{\Gamma a\,\Gamma b\,\Gamma c}{\Gamma(1-a+b+c)}$ c) $\frac{\Gamma a\,\Gamma b\,\Gamma c}{\Gamma(1+a+b+c)}$ d) $\frac{\Gamma a\,\Gamma b\,\Gamma c}{\Gamma(1+a+b-c)}$	c
11	The mass of the octant of the ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ if the density at any point being kxyz is given by $M = ka^2b^2c^2\int_0^{\pi/2}\int_0^{\pi/2}\int_0^1 r^5\sin^3\theta\cos\theta\sin\phi\cos\phi d\theta d\phi dr =$ a) $\frac{ka^2b^2c^2}{45}$ b) $\frac{ka^2b^2c^2}{48}$ c) $\frac{ka^2b^2c^2}{40}$ d) $\frac{ka^2b^2c^2}{42}$	b
12	The volume of the ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ is given by $V = 8abc\int_0^{\pi/2}\int_0^{\pi/2}\int_0^1 r^2\sin\theta d\theta d\phi dr =$ a) $\frac{2abc}{3}$ b) $\frac{abc\pi}{3}$ c) $\frac{2abc\pi}{3}$ d) $\frac{4abc\pi}{3}$	d

13	The volume of the tetrahedron bounded by the co-ordinates planes and the plane $\frac{x}{2}+\frac{y}{3}+\frac{z}{4}=1$ is a) 2 b) 3 c) 4 d) 1	C
14	The volume enclosed by the cone $x^2+y^2=z^2$ and the paraboloid $x^2+y^2=z$ given by $V=4\int_0^{\pi/2}\int_0^1 (r-r^2)rd\theta dr=$ a) $\frac{\pi}{4}$ b) $\frac{\pi}{6}$ c) $\frac{\pi}{2}$ d) $-\frac{\pi}{4}$	b
15	The volume enclosed by the paraboloid $x^2+y^2=2z$ and the cylinder $x^2+y^2=4$ given by $V=4\int_0^{\pi/2}\int_0^{\rho^2/2}\int_0^2 \rho dzd\rho d\phi=$ a) $\frac{\pi}{4}$ b) $\frac{\pi}{6}$ c) 4π d) 2π	c
16	The Volume of the cylinder $x^2+y^2=2ax$ intercepted between paraboloid $x^2+y^2=2az$ and XY- plane is given by, $V=\frac{1}{2a}.2\int_0^{\pi/2}\int_0^{2a\cos\theta} r^2.rd\theta dr=$ a) $\frac{3\pi}{4}$ b) $\frac{3\pi a^3}{4}$ c) $\frac{a^3\pi}{4}$ d) $\frac{3a^3}{4}$	b

Multiple Choice Questions
Engineering Mathematics - II
Unit II: Application of Differential Equations
Type: Orthogonal Trajectories

1	If the differential equation of family of straight lines $y = mx$ is $\frac{dy}{dx} = \frac{y}{x}$ then its orthogonal trajectories is
A	$xy = k$
B	$x^2 - y^2 = k^2$
C	$y = k\,x$
D	$x^2 + y^2 = k^2$
Ans	**D**
Marks	**2**
Unit	**IIa**

2	If the differential equation of family of curves $y = cx^2$ is $\frac{dy}{dx} = \frac{2y}{x}$ then its orthogonal trajectories is
A	$2x^2 - y^2 = k$
B	$\frac{1}{2}\log y = \log x + k$
C	$y = kx^2$
D	$x^2 + 2y^2 = k$
Ans	**D**
Marks	**2**
Unit	**IIa**

3	If the differential equation of family of curves $y = ce^x$ is $\frac{dy}{dx} = y$ then its orthogonal trajectories is
A	$x^2 + 2y = k$
B	$2x - y^2 = k$
C	$2x + y^2 = k$
D	$2x^2 + y = k$
Ans	**C**
Marks	**2**
Unit	**IIa**

4	If the differential equation of family of curves $y = cx^3$ is $\frac{dy}{dx} = \frac{3y}{2x}$ then its orthogonal trajectories is
A	$3x^2 + 2y^2 = k$
B	$2x^2 + 3y^2 = k$
C	$2x^2 - 3y^2 = k$
D	$3x^2 - 2y^2 = k$
Ans	**B**
Marks	**2**
Unit	**IIa**

5	If the differential equation of family of curves $2x^2 + y^2 = c$ is $4x + 2y\frac{dy}{dx} = 0$ then its orthogonal trajectories is
A	$y^2 = kx$
B	$x^2 = ky$
C	$x^2 + ky = 0$
D	$x + ky^2 = 0$
Ans	**A**
Marks	**2**
Unit	**IIa**

6	If the differential equation of family of curves $y = (x-k)^2$ is $\frac{dy}{dx} = 2\sqrt{y}$ then its orthogonal trajectories is
A	$\frac{4}{3}y^{\frac{3}{2}} = \frac{2}{3}x + k$
B	$\frac{1}{3}y^{\frac{3}{2}} + x = k$
C	$\frac{4}{3}y^{\frac{3}{2}} + \frac{2}{3}x = k$
D	$y^{\frac{1}{2}} = (x-k)$
Ans	**C**
Marks	**2**
Unit	**IIa**

7	If the differential equation of family of curves $x^{\frac{2}{3}}+y^{\frac{2}{3}}=c^{\frac{2}{3}}$ is $y^{-\frac{1}{3}}\frac{dy}{dx}=-x^{-\frac{1}{3}}$ then its orthogonal trajectories is
A	$x^{\frac{4}{3}}+y^{\frac{4}{3}}=k$
B	$x^{\frac{4}{3}}-y^{\frac{4}{3}}=k$
C	$x^{\frac{2}{3}}+y^{\frac{2}{3}}=k$
D	$x^{\frac{2}{3}}-y^{\frac{2}{3}}=k$
Ans	**B**
Marks	**2**
Unit	**IIa**

8	The orthogonal trajectories of family of curves $y-2x=c$ is
A	$x-2y=k$
B	$x+y=k$
C	$2x+y=k$
D	$x+2y=k$
Ans	**D**
Marks	**2**
Unit	**IIa**

9	Orthogonal trajectories of family of curves $x^2+2y^2=c^2$ whose differential equation is $\frac{dy}{dx}=-\frac{x}{2y}$, is
A	$x^2=ky$
B	$x^2=\frac{k}{y}$
C	$x^2+2y^2=k^2$
D	None of these
Ans	**A**
Marks	**2**
Unit	**IIa**

10	If the differential equation of family of curves $r=ce^{\theta}$ is $\frac{dr}{d\theta}=r$ then its orthogonal trajectories is given by
A	$\frac{r^2}{2}+\theta=k$
B	$r=ke^{-\theta}$
C	$\frac{r^2}{2}-\theta=k$
D	$r=\log\theta+k$
Ans	**B**
Marks	**2**
Unit	**IIa**

11	If the differential equation of family of curves $r = c(\sec\theta + \tan\theta)$ is $\frac{dr}{d\theta} = r\sec\theta$ then its orthogonal trajectories is given by
A	$\log r - \sin\theta = k$
B	$-\sin\theta = \frac{r^2}{2} + k$
C	$-\frac{r^2}{2} = \log(\sec\theta + \tan\theta) + k$
D	$\log r = -\sin\theta + k$
Ans	**D**
Marks	**2**
Unit	**IIa**

12	If the differential equation of family of curves $r^n \cos n\theta = a^n$ is $\frac{1}{r}\frac{dr}{d\theta} = \tan n\theta$ then its orthogonal trajectories is given by
A	$r^n \sin n\theta = k^n$
B	$r^n = k^n \sin n\theta$
C	$\frac{1}{r} = \log \sin n\theta + k$
D	$r^2 = 2k^n \sin n\theta$
Ans	**A**
Marks	**2**
Unit	**IIa**

13	If the differential equation of family of curves $r^n = b\operatorname{cosec} n\theta$ is $\frac{1}{r}\frac{dr}{d\theta} = -\cot n\theta$ then its orthogonal trajectories is given by
A	$\frac{1}{r} = \log\cos n\theta + k$
B	$r^n = k\cos n\theta$
C	$r^n = k\sec n\theta$
D	$r^2 = 2k^n \cos n\theta$
Ans	**C**
Marks	**2**
Unit	**IIa**

14	If the differential equation of family of curves $r = \frac{a\theta}{1+\theta}$ is $\frac{dr}{d\theta} = \frac{r}{\theta(1+\theta)}$ then its orthogonal trajectories is given by
A	$r(1+\theta) = k\theta$
B	$\frac{\theta^2}{2} + \log\theta = \log r + k$
C	$\theta^2 + \theta^3 = -6\log r + k$
D	$3\theta^2 + 2\theta^3 = -6\log r + k$
Ans	**D**
Marks	**2**
Unit	**IIa**

15	If the differential equation of family of curves $r = 2a(\sin\theta + \cos\theta)$ is $\frac{dr}{d\theta} = \frac{r(\cos\theta - \sin\theta)}{(\cos\theta + \sin\theta)}$ then its orthogonal trajectories is given by
A	$r = \frac{k}{\cos\theta - \sin\theta}$
B	$r = k(\cos\theta - \sin\theta)$
C	$r = k(\cos\theta + \sin\theta)$
D	$r + k(\cos\theta + \sin\theta) = 0$
Ans	**A**
Marks	**2**
Unit	**IIa**

16	If the differential equation of family of curves $r = a\sec^2\frac{\theta}{2}$ is $\frac{dr}{d\theta} = r\tan\frac{\theta}{2}$ then its orthogonal trajectories is given by
A	$-2\log cos\frac{\theta}{2} = \log r + \log k$
B	$2\log\sin\frac{\theta}{2} = \log r + \log k$
C	$-2\log\sin\frac{\theta}{2} = \log r + \log k$
D	$2\log\cos\frac{\theta}{2} = \log r + \log k$
Ans	**C**
Marks	**2**
Unit	**IIa**

17	If the differential equation of family of curves $r^2 = a\cos 2\theta$ is $\frac{dr}{d\theta} = -r\tan 2\theta$ then its orthogonal trajectories is given by
A	$\frac{1}{2}\log\cos 2\theta = \log r + \log k$
B	$\frac{1}{2}\log\sin 2\theta = \log r + \log k$
C	$\log\sin 2\theta = -r^2 + k$
D	$\frac{1}{2}\log\sin 2\theta = -\log r + \log k$
Ans	**B**
Marks	**2**
Unit	**IIa**

Unit II: Application of Differential Equations
Type: Newton's Law of Cooling

1	Suppose a corpse at a temperature of $32^0 C$ arrives at mortuary where the temperature is kept at $10^0 C$. If the corpse cools to $27^0 C$ in 5 minutes. If the differential equation by Newton's law of cooling is $\frac{dT}{dt} = -(0.05)(T-10)$, then temperature T of corpse at any time t is given by
2	A body originally at $80^0 C$ cools down to $60^0 C$ in 20 minutes in a room where the temperature is $40^0 C$. The differential equation by Newton's law of cooling is $\frac{d\theta}{dt} = -k(\theta - 40)$, then the value of k is
3	By Newton's law of cooling the differential equation of body originally at $80^0 C$ cools down to $60^0 C$ in 20 minutes in surrounding temperature of $40^0 C$ is $\frac{d\theta}{dt} = -(0.03465)(\theta - 40)$. The temperature of the body after 40 minutes is
4	A metal ball is heated to a temperature of $100^0 C$ and at time $t=0$ it is placed in water which is maintained at $40^0 C$. The temperature of the ball reduces to $60^0 C$ in 4 minutes. By Newton's law of cooling the differential equation is $\frac{d\theta}{dt} = -\left(\frac{1}{4}\log_e 3\right)(\theta - 40)$. Then the time required to reduce the temperature of ball to $50^0 C$ is
5	Suppose a body at a temperature of 30℃ cools down to $27^\circ C$ in 2 minutes, where the temperature of the surrounding is 10℃ If the differential equation by Newton's law of cooling is $\frac{dT}{dt} = -(0.08)(T-10)$, then temperature T of the body at any time t is given by
6	A body originally at 100℃ cools down to 80 ℃ in 20 minutes in a room where the temperature is 30℃. The differential equation by Newton's law of cooling is, $\frac{d\theta}{dt} = -k(\theta - 30)$ then the value of k is
7	By Newton's law of cooling the differential equation of body originally at 60℃ cools down to 40℃ in 20 minutes in surrounding temperature of 20℃ is $\frac{d\theta}{dt} = -(0.3465)(\theta - 20)$. The temperature of the body after 40 minutes is
8	A thermometer is taken outdoors where the temperature of the surrounding is 5℃ from the room at temperature 35℃ and the reading drops to 15℃ in 2 min. By Newton's law of cooling the differential equation is $\frac{d\theta}{dt} = -(0.55)(\theta - 5)$.. Then the time required to reduce the temperature 10℃ is
9	A thermometer is taken outdoors where the temperature is 0℃ , from a room in which the temperature is 21℃ and temperature drops to 10℃ in 1 min. If the differential equation by Newton's law of cooling is $\frac{dT}{dt} = -(0.7419)T$, then the temperature T of thermometer at time t is given by
10	If the temperature of the air is $30°K$ and substance cools from $37°K$ to $34°K$ in 15 min. By Newton's law of cooling the differential equation is $\frac{d\theta}{dt} = -(0.0373)(\theta - 30)$. Then the time at which the temperature will be $31°K$ is

Type: Applications to Electrical Circuits

1*	In a circuit containing resistance R and inductance L in series with constant e.m.f. E, the current i is given by $i=\frac{E}{R}\left(1-e^{-\frac{R}{L}t}\right)$, then the time required to builds current half of its theoretical maximum is
A	$\frac{L}{R\log 2}$
B	$\frac{L\log 2}{R}$
C	$\frac{R\log 2}{L}$
D	0
Ans	**B**
Marks	**2**
Unit	**IIb**

2*	If the differential equation for current in an electric circuit containing resistance R and inductance L in series with constant e.m.f. E, the current i is $L\frac{di}{dt}+Ri=E$, then the current at any time t is given by
A	$i=\frac{E}{R}-Ae^{-\frac{R}{L}t}$; A is arbitrary constant
B	$i=\frac{E}{R}+Ae^{-\frac{R}{L}t}$; A is arbitrary constant
C	$i=\frac{E}{R}+Ae^{\frac{R}{L}t}$; A is arbitrary constant
D	$i=\frac{E}{R}+e^{-\frac{R}{L}t}$
Ans	**B**
Marks	**2**
Unit	**IIb**

3*	The charge q on the plate of condenser of capacity C charge through a resistance R by steady voltage V satisfies differential equation $R\frac{dq}{dt}+\frac{q}{C}=V$, then charge q at any time t is
A	$q=CV+Ae^{-\frac{1}{RC}t}$; A is arbitrary constant
B	$q=CV-Ae^{\frac{1}{RC}t}$; A is arbitrary constant
C	$q=C+Ae^{\frac{1}{RC}t}$; A is arbitrary constant
D	$q=CV+e^{\frac{1}{RC}t}$
Ans	**A**
Marks	**2**
Unit	**IIb**

4*	A resistance $R=100$ ohms, an inductance $L=0.5$ henry are connected in series with a battery of 20 Volts. The differential equation for the current i is $0.5\frac{di}{dt}+100i=20$, then current i at any time t is
A	Ae^{-200t}; A is arbitrary constant
B	$\frac{1}{5}+Ae^{200t}$; A is arbitrary constant
C	$2+Ae^{-200t}$; A is arbitrary constant
D	$\frac{1}{5}+Ae^{-200t}$; A is arbitrary constant
Ans	**D**
Marks	**1**
Unit	**IIb**

Multiple Choice Questions
Engineering Mathematics - II
Unit II: Application of Differential Equations
Type: Rectilinear Motion

Question 1*	Differential equation of motion of a body of mass m falls from rest under gravity in a fluid whose resistance to motion at any time t is mk times its velocity where k is constant is $\frac{dv}{dt} = g - kv$ then the relation between velocity and time t is
Option A	$t = \frac{1}{k}\log\frac{g-kv}{g}$
Option B	$t = \frac{1}{k}\log\frac{g}{g-kv}$
Option C	$t = \frac{1}{k}\log\frac{g}{g+kv}$
Option D	$t = -\frac{1}{k}\log\frac{1}{g-kv}$
Option E	
Correct Answer	**B**
Marks	**2**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Question 2*	A body of mass m falling from rest is subjected to the force of gravity and air resistance proportional to square of velocity $\left(kv^2\right)$ satisfies the differential equation $mv\frac{dv}{dx} = k\left(a^2 - v^2\right)$ where $ka^2 = mg$, then the relation between velocity and displacement is
Option A	$\frac{2kx}{m} = \log \frac{a^2}{a^2 - v^2}$
Option B	$\frac{2kx}{m} = \log \frac{a^2 - v^2}{a^2}$
Option C	$2kx = \log \frac{1}{a^2 - v^2}$
Option D	$\frac{x}{m} = \log \frac{a^2}{a^2 - v^2}$
Option E	
Correct Answer	**A**
Marks	**2**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Question 3*	A vehicle starts from rest and its acceleration is given by $\frac{dv}{dt} = k\left(1 - \frac{t}{T}\right)$ where k and T are constant then the velocity v in terms of time t is given by
Option A	$v = k\left(t - \frac{t^2}{2}\right)$
Option B	$v = k\left(t - \frac{t^2}{T}\right)$
Option C	$v = k\left(\frac{t^2}{2} - \frac{t^3}{3T}\right)$
Option D	$v = k\left(t - \frac{t^2}{2T}\right)$
Option E	
Correct Answer	**D**
Marks	**2**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Question 4*	A particle of mass m is projected upward with velocity V . Assuming the air resistance k times its velocity and equation of motion is $m\frac{dv}{dt}=-mg-kv$ then relation between velocity v and time t is
Option A	$t=\frac{m}{k}\log\left(\frac{mg+kV}{mg+kv}\right)$
Option B	$t=\frac{m}{k}\log\left(\frac{mg+kv}{mg+kV}\right)$
Option C	$t=m\log\left(\frac{mg+kV}{mg+kv}\right)$
Option D	$t=\log\left(\frac{mg+kv}{mg+kV}\right)$
Option E	
Correct Answer	**A**
Marks	**2**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Question 5*	A body of mass m falls from rest under gravity and retarding force due to air resistance is proportional to square of velocity (kv^2) satisfies the differential equation $\frac{dv}{dt}=k(a^2-v^2)$, where $a^2=\frac{g}{k}$ then the relation between velocity and time t is
Option A	$t=\frac{1}{2ak}\log\left(\frac{a+v}{a-v}\right)$
Option B	$t=\log\left(\frac{a+v}{a-v}\right)$
Option C	$t=\frac{1}{2ak}tan^{-1}\left(\frac{v}{a}\right)$
Option D	$t=\frac{1}{2ak}\log(a^2-v^2)$
Option E	
Correct	**A**

Answer	
Marks	**2**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Question 6*	A moving body opposed by a force per unit mass of value cx and resistance per unit mass of value bv^2 where x and v are displacement and velocity of the body at that instant, satisfies the differential equation $v\frac{dv}{dx}+bv^2=-cx$ then the integrating factor is
Option A	e^{-2bx}
Option B	$\frac{1}{e^{-bx}}$
Option C	e^{2bx}
Option D	$-\frac{1}{e^{-2bx}}$
Option E	
Correct Answer	**C**
Marks	**2**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Question 7	A moving body opposed by a force per unit mass of value cx and resistance per unit mass of value bv^2 where x and v are displacement and velocity of the body at that instant, satisfies the differential equation $\frac{du}{dx} + 2bu = -2cx$ with the integrating factor e^{2bx} the relation between velocity and distance is (take $u = v^2$)
Option A	$v^2 = \frac{c}{2b^2} - \frac{c\,x}{b} - Ae^{2bx}$
Option B	$v^2 = \frac{c}{2b^2} + \frac{c\,x}{b} + Ae^{-2bx}$
Option C	$v^2 = \frac{c}{2b^2} + \frac{c\,x}{b} + Ae^{2bx}$, A is constant of integration
Option D	$v^2 = \frac{c}{2b^2} - \frac{c\,x}{b} + Ae^{-2bx}$, A is constant of integration
Option E	
Correct Answer	**D**
Marks	**2**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Question 8	A particle of mass m is projected vertically upward with velocity V_0 and the air resistance produced retardation kv^2, where v is the velocity at any instant satisfies the differential equation $\frac{v\,dv}{g+kv^2} = -dx$,then the relation between distance x and velocity v is
Option A	$x = \frac{1}{2k}\log\left[\frac{g+k{V_0}^2}{g+kv^2}\right]$
Option B	$x = \frac{1}{2k}\log\left[\frac{g-k{V_0}^2}{g-kv^2}\right]$
Option C	$x = \frac{1}{2k}\log\left[\frac{g-kv^2}{g+k{V_0}^2}\right]$
Option D	$x = \log\left[\frac{g+k{V_0}^2}{g+kv^2}\right]$

Option E	
Correct Answer	**A**
Marks	**2**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Question 9*	A particle is moving in a straight line with acceleration $k\left(x+\frac{a^4}{x^3}\right)$ directed towards the origin. If it starts from rest at a distance $'a'$ from the origin and the differential equation of motion is $v\frac{dv}{dx}=-k\left(x+\frac{a^4}{x^3}\right)$ then the relation between velocity and distance is
Option A	$\frac{v^2}{2}= k\left[\frac{x^2}{2}-\frac{a^4}{2x^2}\right]$
Option B	$\frac{v^2}{2}= -k\left[\frac{x^2}{2}-\frac{a^4}{2x^2}\right]$
Option C	$\frac{v^2}{2}= -k\left[\frac{x^2}{2}+\frac{a^4}{2x^2}\right]$
Option D	$\frac{v^2}{2}= k\left[\frac{x^2}{2}+\frac{a^4}{2x^2}\right]$
Option E	
Correct Answer	**B**
Marks	**2**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Question 10*	A bullet is fired into sand tank with initial velocity V_0 and its retardation is proportional to $\sqrt{v}$. The equation of motion is $\frac{dv}{dt} = -k\sqrt{v}$ then relation between time t and velocity v is
Option A	$t = \frac{2}{k}\left(\sqrt{V_0 - v}\right)$
Option B	$t = \frac{2}{k}\left(\sqrt{V_0} + \sqrt{v}\right)$
Option C	$t = \frac{2}{k}\left(\sqrt{V_0} - \sqrt{v}\right)$
Option D	$t = \left(\sqrt{v} - \sqrt{V_0}\right)$
Option E	
Correct Answer	**C**
Marks	**2**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Type: One Dimensional Conduction of Heat

Question 1*	Fourier law of heat conduction states that, the quantity of heat flow across an area A cm^2 is
Option A	proportional to product of area A and temperature gradient $\frac{dT}{dx}$
Option B	inversely proportional to product of area A and temperature gradient $\frac{dT}{dx}$
Option C	equal to sum of area A and temperature gradient $\frac{dT}{dx}$
Option D	equal to difference of area A and temperature gradient $\frac{dT}{dx}$
Option E	
Correct Answer	**A**
Marks	**1**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIe**

Question 6*	If q be the quantity of heat that flows across an area A cm^2 and thickness δx in one second where the difference of temperature at the faces is δT, then by Fourier's law of heat conduction
Option A	$q = -k\left(A - \frac{dT}{dx}\right)$, where k is thermal conductivity
Option B	$q = kA\frac{dT}{dx}$, where k is thermal conductivity
Option C	$q = -k\left(A + \frac{dT}{dx}\right)$, where k is thermal conductivity
Option D	$q = -kA\frac{dT}{dx}$, where k is thermal conductivity
Option E	

Correct Answer	**D**
Marks	**1**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIe**

Question 3*	The differential equation for steady state heat loss Q per unit time from a spherical shell with thermal conductivity k radius r_0 carrying steam at temperature T_0, if the spherical shell is covered with insulation of thickness w, the outer surface of which remains at the constant temperature T_1, is $Q = -k\left(4\pi r^2\right)\frac{dT}{dr}$ Then the temperature T of spherical shell of radius r is
Option A	$T = -\frac{Q}{4\pi k}\frac{1}{r^2} + C$
Option B	$T = \frac{Q}{4\pi k}\frac{1}{r} + C$
Option C	$T = -\frac{Q}{4\pi k}\frac{1}{r} + C$
Option D	$T = -\frac{Q}{2\pi k}\frac{1}{r^3} + C$
Option E	
Correct Answer	**B**
Marks	**2**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Question 4*	A pipe 20 cm in diameter contains steam at $150^0 C$ and is protected with covering 5cm thick for which k = 0.0025. If the temperature of the outer surface of the covering is $40^0 C$ and differential equation of conduction of heat is $dT = -\frac{Q}{2\pi k}\frac{dx}{x}$. The amount of heat loss Q is
Option A	$\frac{110(2\pi k)}{\log(1.5)}$
Option B	$\frac{\log(1.5)}{110(2\pi k)}$
Option C	$-\frac{110(2\pi k)}{\log(1.5)}$
Option D	$\frac{110}{\log(1.5)}$
Option E	
Correct Answer	**A**
Marks	**1**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Question 5*	A pipe 10 cm in diameter contains steam at $100^0 C$. It is protected with asbestos 5 cm thick for which k = 0.0006 and outer surface is at $30^0 C$. The differential equation of conduction of heat is $dT = -\frac{Q}{2\pi k}\frac{dx}{x}$. The amount of heat loss Q is
Option A	$\frac{\log 2}{70(2\pi k)}$
Option B	$\frac{70(2\pi k)}{\log 2}$
Option C	$-\frac{70(2\pi k)}{\log 2}$
Option D	$\frac{(2\pi k)}{\log 2}$

Option E	
Correct Answer	**B**
Marks	**1**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Question 6	A steam pipe 20 cm in diameter is protected with covering 6 cm thick and k = 0.0003 cal/cm in a steady state. If the inner surface of the pipe is at $200\ ^0C$ and the outer surfaceof the covering is at 30^0C then heat loss Q in the pipe using $\frac{Q}{2\pi k}\int_{x_1}^{x_2}\frac{dx}{x} = -\int_{t_1}^{t_2} dT$, where $x_1\ ,x_2$ are inner and outer radii and $t_1\ ,t_2$ are temperatures at inner and outer surfaces is
Option A	$Q = 0.6815\quad cal/sec$
Option B	$Q = 68.15\quad cal/sec$
Option C	$Q = -0.6815\quad cal/sec$
Option D	$Q = 6815\quad cal/sec$
Option E	
Correct Answer	**A**
Marks	**1**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Question 7	A pipe 20 cm is diameter contains steam at $150\ {}^0C$ and is protected with a covering 5 cm thick for which k = 0.0025. If the temperature of the outer surface of the covering is $40\ {}^0C$ .What is the heat loss (Q) through the covering under steady state conditions. [Use $\frac{Q}{2\pi k}\int_{x_1}^{x_2} \frac{dx}{x} = -\int_{t_1}^{t_2} dT$, where$Q$ is a heat loss.]
Option A	$Q = \frac{2\,\pi\,k}{log_e 1.5} \quad cal/sec$
Option B	$Q = \frac{-220\,\pi\,k}{log_e 1.5} \quad cal/sec$
Option C	$Q = \frac{220\,\pi\,k}{log_e 1.5} \quad cal/sec$
Option D	None of the above
Option E	
Correct Answer	**B**
Marks	**1**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Question 8	A pipe 20 cm is diameter contains steam at $150\ {}^0C$ and is protected with a covering 5 cm thick for which k = 0.0025. If the temperature of the outer surface of the covering is $40\ {}^0C$ and the heat loss $Q = 0.03874\ \ cal/sec$. What is the temperature half-way through the covering under steady state conditions using $\frac{Q}{2\pi k}\int_{x_1}^{x_2} \frac{dx}{x} = -\int_{t_1}^{t_2} dT$.
Option A	$T = 98.5\ {}^0C$
Option B	$T = 30.5\ {}^0C$

Option C	$T = 89.5\ ^0C$
Option D	$T = 895\ ^0C$
Option E	
Correct Answer	**C**
Marks	**1**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Question 9	What is heat loss per unit time from a unit length of pipe of radius r_0 carrying steam of temperature T_0 if the pipe is covered with insulation of thickness w. The outer surface of which remains at constant temperature T_1. In a steady state condition it form a differential equation $Q\ \frac{dr}{r} = -2\ \pi\ k\ dT$, where Q is a heat loss
Option A	$Q = \frac{2\ \pi\ k\ [T_1 - T_0]}{\log\left(\frac{r_0\ +\ w}{r_0}\right)}$
Option B	$Q = \frac{2\ \pi\ k\ [T_1 + T_0]}{\log\left(\frac{r_0\ +\ w}{r_0}\right)}$
Option C	$Q = -\frac{2\ \pi\ k\ [T_1 + T_0]}{\log\left(\frac{r_0\ -\ w}{r}\right)}$
Option D	$Q = -\frac{2\ \pi\ k\ [T_1 - T_0]}{\log\left(\frac{r_0\ +\ w}{r_0}\right)}$
Option E	
Correct Answer	**D**
Marks	**1**
Explanatio	

n(Optional)	
Difficulties	
Sub Topic	**IIc**

Question 6	A long hollow pipe has an inner diameter of 10 cm and outer diameter of 20 cm.The inner surface is kept at $200\ ^0C$ and outer surface at $50\ ^0C$ for which k = 0.12. What is the heat loss . In a steady state condition it form a differential equation $Q\ \frac{dr}{r} = -2\,\pi\,k\,dT$, where Q is a heat loss. [Use $\frac{Q}{2\pi k}\int_{x_1}^{x_2} \frac{dx}{x} = -\int_{t_1}^{t_2} dT$]
Option A	$Q = \frac{-300\,\pi\,k}{log_e 2}\quad cal/sec$
Option B	$Q = \frac{300\,\pi\,k}{log_e 2}\quad cal/sec$
Option C	$Q = \frac{-30\,\pi\,k}{log_e 2}\quad cal/sec$
Option D	$Q = \frac{300\,\pi\,k}{log_e 1.2}\quad cal/sec$
Option E	
Correct Answer	**B**
Marks	**1**
Explanation(Optional)	
Difficulties	
Sub Topic	**IIc**

Multiple Choice Questions
Engineering Mathematics - II
Unit II: Application of Differential Equations
Type: Orthogonal Trajectories

1*	The differential equation of orthogonal trajectories of family of straight lines $y = mx$ is
A	$\frac{dx}{dy} = -\frac{y}{x}$
B	$\frac{dx}{dy} = -\frac{x}{y}$
C	$\frac{dy}{dx} = \frac{y}{x}$
D	$\frac{dy}{dx} = m$
Ans	**A**
Marks	**1**
Unit	**IId**

2*	If the family of curves is given by $x^2 + 2y^2 = c^2$ then the differential equation of orthogonal trajectories of family is
A	$x - 2y\frac{dy}{dx} = 0$
B	$x + 2y\frac{dx}{dy} = 0$
C	$x + 2y\frac{dy}{dx} = 0$
D	$x - 2y\frac{dx}{dy} = 0$
Ans	**D**
Marks	**1**
Unit	**IId**

3*	The differential equation of orthogonal trajectories of family of curves $r = a\cos\theta$ is
A	$r^2 \frac{d\theta}{dr} = \tan\theta$
B	$\frac{1}{r}\frac{d\theta}{dr} = -\tan\theta$
C	$r\frac{d\theta}{dr} = -\tan\theta$
D	$r\frac{d\theta}{dr} = \tan\theta$
Ans	**D**
Marks	**1**
Unit	**IId**

<u>NEW</u>

4	If the family of curves is given by $x^{2/3} + y^{2/3} = C^{2/3}$ then the differential equation of orthogonal trajectories of family is
A	$\frac{3}{5}x^{5/3} - \frac{3}{5}y^{5/3}\frac{dx}{dy} = 0$
B	$x^{-1/3} - y^{-1/3}\frac{dx}{dy} = 0$
C	$x^{-1/3} + y^{-1/3}\frac{dx}{dy} = 0$
D	$x^{2/3} - y^{2/3}\frac{dy}{dx} = 0$
Ans	**B**
Marks	**1**
Unit	**IId**

5*	The differential equation of orthogonal trajectories of family of curves $x^2 - y^2 = C$ is
A	$x + y\dfrac{dx}{dy} = 0$
B	$x - y\dfrac{dx}{dy} = 0$
C	$y + x\dfrac{dx}{dy} = 0$
D	$x - y\dfrac{dy}{dx} = 0$
Ans	**A**
Marks	**1**
Unit	**IId**

6*	The differential equation of orthogonal trajectories of family of curves $y = Cx^2$ is
A	$-\dfrac{dx}{dy} = \dfrac{x}{2y}$
B	$\dfrac{dy}{dx} = \dfrac{2y}{x}$
C	$-\dfrac{dx}{dy} = \dfrac{2y}{x}$
D	$\dfrac{dx}{dy} = \dfrac{2y}{x}$
Ans	**C**
Marks	**1**
Unit	**IId**

7*	The differential equation of orthogonal trajectories of family of curves $r = a(1+\cos\theta)$ is
A	$r\dfrac{dr}{d\theta} = \dfrac{\sin\theta}{1+\cos\theta}$
B	$\dfrac{1}{r}\dfrac{dr}{d\theta} = \dfrac{\sin\theta}{1+\cos\theta}$
C	$r\dfrac{d\theta}{dr} = \dfrac{1+\cos\theta}{\sin\theta}$
D	$r\dfrac{d\theta}{dr} = \dfrac{\sin\theta}{1+\cos\theta}$
Ans	**D**
Marks	**1**
Unit	**IId**

8	The differential equation of orthogonal trajectories of family of curves $r = \dfrac{a\theta}{1+\theta}$ is
A	$\dfrac{1}{r}\dfrac{d\theta}{dr} = \dfrac{1}{\theta(1+\theta)}$
B	$r\dfrac{d\theta}{dr} = \dfrac{-1}{\theta(1+\theta)}$
C	$r\dfrac{d\theta}{dr} = \dfrac{1}{(1+\theta)}$
D	$\dfrac{d\theta}{dr} = \dfrac{r}{(1+\theta)}$
Ans	**B**
Marks	**1**
Unit	**IId**

9	The differential equation of orthogonal trajectories of family of curves $r = 2a(\cos\theta + \sin\theta)$ is
A	$r\dfrac{d\theta}{dr} = \dfrac{\sin\theta - \cos\theta}{\cos\theta + \sin\theta}$
B	$\dfrac{1}{r}\dfrac{dr}{d\theta} = \dfrac{\sin\theta - \cos\theta}{\cos\theta + \sin\theta}$
C	$r\dfrac{d\theta}{dr} = \dfrac{\cos\theta + \sin\theta}{\sin\theta - \cos\theta}$
D	$\dfrac{d\theta}{dr} = \dfrac{\sin\theta - \cos\theta}{\cos\theta + \sin\theta}$
Ans	**A**
Marks	**1**
Unit	**IId**

10	The differential equation of orthogonal trajectories of family of curves $r = a(1 - \cos\theta)$ is
A	$-r\dfrac{d\theta}{dr} = \dfrac{\sin\theta}{1 - \cos\theta}$
B	$r\dfrac{d\theta}{dr} = \dfrac{\sin\theta}{1 - \cos\theta}$
C	$-r^2\dfrac{d\theta}{dr} = \dfrac{\sin\theta}{1 - \cos\theta}$
D	$-r\dfrac{d\theta}{dr} = \dfrac{1 - \cos\theta}{\sin\theta}$
Ans	**A**
Marks	**1**
Unit	**IId**

11*	The differential equation of orthogonal trajectories of family of curves $ay^2 = x^3$ is
A	$2x\frac{dy}{dx} = 3y$
B	$-2y\frac{dx}{dy} = 3x$
C	$-2x\frac{dx}{dy} = 3y$
D	$-2y\frac{dx}{dy} = 3x^2$
Ans	**C**
Marks	**1**
Unit	**IId**

12	The differential equation of orthogonal trajectories of family of curves $r = a\sec\theta$ is
A	$\frac{1}{r}\frac{dr}{d\theta} = \tan\theta$
B	$-r\frac{d\theta}{dr} = \tan\theta$
C	$r\frac{d\theta}{dr} = \tan\theta$
D	$\frac{dr}{d\theta} = \sec\theta\tan\theta$
Ans	**B**
Marks	**1**
Unit	**IId**

13	The differential equation of orthogonal trajectories of family of curves $r = \dfrac{2a}{1+\cos\theta}$ is
A	$\dfrac{dr}{d\theta} = \dfrac{-\sin\theta}{(1+\cos\theta)^2}$
B	$\dfrac{1}{r}\dfrac{d\theta}{dr} = \dfrac{-\sin\theta}{1+\cos\theta}$
C	$-r\dfrac{d\theta}{dr} = \dfrac{1+\cos\theta}{\sin\theta}$
D	$r\dfrac{d\theta}{dr} = \dfrac{-\sin\theta}{1+\cos\theta}$
Ans	**D**
Marks	**1**
Unit	**IId**

14	The differential equation of orthogonal trajectories of family of curves $x^2 + y^2 + 2x + C = 2$ is
A	$x - y\dfrac{dx}{dy} + 1 = 0$
B	$x - y\dfrac{dx}{dy} = 0$
C	$x + y\dfrac{dy}{dx} = 0$
D	$x + y + 1 = 0$
Ans	**A**
Marks	**1**
Unit	**IId**

14*	The differential equation of orthogonal trajectories of family of curves $y-2x=C$ is
A	$\frac{dy}{dx}-2=0$
B	$-\frac{dy}{dx}-2=0$
C	$\frac{dx}{dy}+2=0$
D	None of These
Ans	**C**
Marks	**1**
Unit	**IId**

15	For Finding orthogonal trajectories of $f(x\ ,\ y,\ C)=0$ we replace $\frac{dy}{dx}$ by
A	$-\frac{dx}{dy}$
B	$\frac{dx}{dy}$
C	$\frac{y}{x}$
D	1
Ans	**A**
Marks	**1**
Unit	**IId**

16*	For Finding orthogonal trajectories of $f(r, \theta, a) = 0$ we replace $\frac{dr}{d\theta}$ by
A	$r^2 \frac{d\theta}{dr}$
B	$\frac{d\theta}{dr}$
C	$-r^2 \frac{d\theta}{dr}$
D	$-r \frac{d\theta}{dr}$
Ans	**C**
Marks	**1**
Unit	**IId**

Type: Newton's Law of Cooling

1*	Newton's law of cooling states that
A	The temperature of a body changes at the rate which is proportional to the temperatures of surrounding medium
B	The temperature of a body changes at the rate which is inversely proportional to the difference in temperatures between that of surrounding medium and that of body it self
C	The temperature of a body changes at the rate which is proportional to the sum of temperatures of surrounding medium and that of body it self
D	The temperature of a body changes at the rate which is proportional to the difference in temperatures between that of surrounding medium and that of body it self
Ans	**D**
Marks	**1**
Unit	**IId**

2*	A metal ball is heated to a temperature of $100^0 C$ and at time $t=0$ it is placed in water which is maintained at $40^0 C$. By Newton's law of cooling the differential equation satisfied by temperature θ of metal ball at any time t is
A	$\frac{d\theta}{dt}=-k(\theta-100)$
B	$\frac{d\theta}{dt}=-k(\theta-40)$
C	$\frac{d\theta}{dt}=-k\theta$
D	$\frac{d\theta}{dt}=-k\theta(\theta-40)$
Ans	**B**
Marks	**1**
Unit	**IId**

3*	If the rate of Growth is proportional to the amount x of substance present and if $\frac{dx}{dt}=kx$, Then x is equal to (with C_1 constant)
A	$C_1 e^{-kt}$
B	$C_1 e^{kt}$
C	$C_1 e^{-2kt}$
D	$C_1 e^{2kt}$
Ans	**B**
Marks	**1**
Unit	**IId**

4	If the body is Heated at the rate of $'at'$ and Cooling at the rate of $'k\theta'$ then the rate at which the body temperature changes due to both these effects is
A	$\frac{d\theta}{dt} = k\theta + at$
B	$\frac{d\theta}{dt} = k\theta - at$
C	$\frac{d\theta}{dt} = -k\theta + at$
D	$\frac{d\theta}{dt} = -k\theta - at$
Ans	**C**
Marks	**1**
Unit	**IId**

5*	If the rate of Growth is $\left(\frac{dx}{dt} = kx\right)$ Then The rate at which bacteria is proportional to the instantaneous number present .If the original number double in 2 *hours* Then k is equal to
A	$k = \frac{\log 2}{2}$
B	$k = \log 2$
C	$k = \frac{2}{\log 2}$
D	$k = 2$
Ans	**A**
Marks	**1**
Unit	**IId**

6*	A body whose temperature is initially $100^\circ C$ is allowed to cool in air , whose temperature remains at a constant temperature $20^\circ C$ .It is given that after 10 minutes, the body has cooled to $40^\circ C$ By Newton's law of cooling the differential equation .
A	$\frac{d\theta}{dt} = -k\left(\theta - 60\right)$
B	$\frac{d\theta}{dt} = -k\left(\theta - 100\right)$
C	$\frac{d\theta}{dt} = -k\left(\theta - 40\right)$
D	$\frac{d\theta}{dt} = -k\left(\theta - 20\right)$
Ans	**D**
Marks	**1**
Unit	**IId**

Multiple Choice Questions
Engineering Mathematics - II
Unit II: Application of Differential Equations
Type: Rectilinear Motion

1	Rectilinear motion is a motion of body along a
A	straight line
B	circular path
C	Parabolic path
D	None of these
Ans	**A**
Marks	**1**
Unit	**IIe**

2	According to D'Alembert's principle algebraic sum of forces acting on a body along a given direction is equal to
A	Velocity $\times$ Acceleration
B	Mass $\times$ Velocity
C	Mass $\times$ displacement
D	Mass $\times$ Acceleration
Ans	**D**
Marks	**1**
Unit	**IIe**

3	A particle moving in straight line with acceleration $k\left(x+\frac{a^4}{x^3}\right)$ directed towards origin. The equation of motion is
A	$\frac{dv}{dx}=-k\left(x+\frac{a^4}{x^3}\right)$
B	$v\frac{dv}{dx}=k\left(x+\frac{a^4}{x^3}\right)$
C	$v\frac{dv}{dx}=-k\left(x+\frac{a^4}{x^3}\right)$
D	$\frac{dv}{dx}=\left(x+\frac{a^4}{x^3}\right)$
Ans	**C**
Marks	**1**
Unit	**IIe**

4	A particle of mass m moves in a horizontal straight line OA with acceleration $\frac{k}{x^3}$ at a distance x and directed towards origin O. Then the differential equation of motion is
A	$v\frac{dv}{dx}=\frac{k}{x^3}$
B	$v\frac{dv}{dx}=-\frac{k}{x^3}$
C	$\frac{dv}{dx}=-\frac{k}{x^3}$
D	$\frac{dv}{dx}=\frac{k}{x^3}$
Ans	**B**
Marks	**1**
Unit	**IIe**

5	A body of mass m falling from rest is subjected to a force of gravity and air resistance proportional to square of velocity $\left(kv^2\right)$. The equation of motion is
A	$m\frac{dv}{dx} = mg - kv^2$
B	$mv\frac{dv}{dx} = mg + kv^2$
C	$mv\frac{dv}{dx} = -kv^2$
D	$mv\frac{dv}{dx} = mg - kv^2$
Ans	**D**
Marks	**1**
Unit	**IIe**

6	A particle is projected vertically upward with velocity v_1 and resistance of air produces retardation $\left(kv^2\right)$ where v is velocity. The equation of motion is
A	$v\frac{dv}{dx} = -g - kv^2$
B	$v\frac{dv}{dx} = -g + kv^2$
C	$v\frac{dv}{dx} = -kv^2$
D	$v\frac{dv}{dx} = g - kv^2$
Ans	**A**
Marks	**1**
Unit	**IIe**

7	A body starts moving from rest is opposed by a force per unit mass of value (cx) resistance per unit mass of value (bv^2) where v and x are velocity and displacement of body at that instant. The differential equation of motion is
A	$mv\frac{dv}{dx} = -cx - bv^2$
B	$v\frac{dv}{dx} = cx + bv^2$
C	$v\frac{dv}{dx} = -cx - bv^2$
D	$\frac{dv}{dx} = -cx - bv^2$
Ans	**C**
Marks	**1**
Unit	**IIe**

8	The body of mass m falls from rest under gravity, in a fluid whose resistance to motion at any time t is mk times its velocity where k is constant. The differential equation of motion is
A	$\frac{dv}{dt} = -g - kv$
B	$\frac{dv}{dt} = g - kv$
C	$\frac{dv}{dt} = g + kv$
D	$\frac{dv}{dt} = mg - mkv$
Ans	**B**
Marks	**1**
Unit	**IIe**

9	A particle of mass m is projected vertically upward with velocity V, assuming the air resistance k times its velocity where k is constant. The differential equation of motion is
A	$\frac{dv}{dt} = mg - kv$
B	$m\frac{dv}{dt} = -mg + kv$
C	$m\frac{dv}{dt} = -kv$
D	$m\frac{dv}{dt} = -mg - kv$
Ans	**D**
Marks	**1**
Unit	**IIe**

10	Assuming that the resistance to movement of a ship through water in the form of $\left(a^2 + b^2v^2\right)$ where v is the velocity, a and b are constants. The differential equation for retardation of the ship moving with engine stopped.
A	$m\frac{dv}{dt} = -\left(a^2 + b^2v^2\right)^2$
B	$m\frac{dv}{dt} = +\left(a^2 + b^2v^2\right)$
C	$m\frac{dv}{dt} = -\left(a^2 + b^2v^2\right)$
D	$m\frac{dv}{dx} = -\left(a^2 + b^2v^2\right)$
Ans	**C**
Marks	**1**
Unit	**IIe**

11	A bullet is fired into sand tank , its retardation proportional to square root of its velocity .The differential equation of motion is
A	$m\frac{dv}{dt} = -mk\sqrt{v}$
B	$m\frac{dv}{dt} = mk\sqrt{v}$
C	$m\frac{dv}{dx} = -mk\sqrt{v}$
D	$m\frac{d^2v}{dt^2} = -mk\sqrt{v}$
Ans	**A**
Marks	**1**
Unit	**IIe**

12	A particle of mass m moves with velocity v along a straight line whose resistance per unit mass is μ rimes cube of velocity .Then the differential equation of motion is
A	$\frac{d^2v}{dt^2} = -\mu v^3$
B	$\frac{dv}{dx} = -\mu v^3$
C	$\frac{dv}{dt} = -\mu v^3$
D	$\frac{dv}{dt} = \mu v^3$
Ans	**C**
Marks	**1**
Unit	**IIe**

13	A particle of unit mass moves in a straight line under the attraction varying inversely as the $\frac{3}{2}th$ power of distance.The differential equation of motion is
A	$\frac{dv}{dt}=k\frac{1}{x^{3/2}}$
B	$\frac{dv}{dt}=-k\frac{1}{x^{3/2}}$
C	$\frac{dv}{dt}=-k\,x^{3/2}$
D	$\frac{dv}{dt}=k\,x^{3/2}$
Ans	**B**
Marks	**1**
Unit	**IIe**

14	The distance x travelled by the particle moving in a straight line at any time t is given by $\cos^{-1}\left(\frac{x^2}{a^2}\right)=2\sqrt{k}t$ where k and a are constant .If the particle will start at a distance a from origin then the particle will arrive at origin in time
A	$\frac{\pi\sqrt{k}}{4}$
B	$\frac{\pi}{\sqrt{k}}$
C	$\frac{\pi}{2\sqrt{k}}$
D	$\frac{\pi}{4\sqrt{k}}$
Ans	**D**
Marks	**1**
Unit	**IIe**

15	The velocity v of a vehicle at any time t is given by $v = k\left(t - \frac{t^2}{2T}\right)$ where k is constant and T is the time taken to attain maximum speed . Then the maximum speed of the vehicle is
A	$\frac{kT}{2}$
B	$\frac{kT}{4}$
C	kT
D	$\frac{kT}{3}$
Ans	**A**
Marks	**1**
Unit	**IIe**

Type: Applications to Electrical Circuits

1	A circuit containing resistance R and inductance L in series with voltage source E. By Kirchhoff's voltage law differential equation for current i is
A	$Li + R\frac{di}{dt} = E$
B	$L\frac{di}{dt} + Ri = E$
C	$L\frac{di}{dt} + Ri = 0$
D	$L\frac{di}{dt} + \frac{q}{C} = E$
Ans	**B**
Marks	**1**
Unit	**IIe**

2	A circuit containing resistance R and capacitance C in series with voltage source E. By Kirchhoff's voltage law differential equation for current $i = \frac{dq}{dt}$ is
A	$L\frac{di}{dt} + \frac{q}{C} = E$
B	$R\frac{dq}{dt} + \frac{q}{C} = 0$
C	$L\frac{di}{dt} + Ri = 0$
D	$R\frac{dq}{dt} + \frac{q}{C} = E$
Ans	**D**
Marks	**1**
Unit	**IIe**

3	A circuit containing inductance L capacitance C in series without applied electromotive force. By Kirchhoff's voltage law differential equation for current i is
A	$L\frac{di}{dt}+\frac{q}{C}=0$
B	$L\frac{di}{dt}+Ri=0$
C	$L\frac{di}{dt}+Ri=E$
D	$L\frac{di}{dt}+\frac{q}{C}=E$
Ans	**A**
Marks	**1**
Unit	**IIe**

4	A circuit containing inductance L capacitance C in series with applied electromotive force E. By Kirchhoff's voltage law differential equation for current i is
A	$L\frac{di}{dt}+Ri=E$
B	$L\frac{di}{dt}+Ri=0$
C	$L\frac{di}{dt}+\frac{q}{C}=E$
D	$L\frac{di}{dt}+\frac{q}{C}=0$
Ans	**C**
Marks	**1**
Unit	**IIe**

5	The differential equation for the current in an electric circuit containing resistance R and inductance L in series with voltage source $E\sin\omega t$ is
A	$L\frac{di}{dt}+\frac{q}{C}=E$
B	$Li+R\frac{di}{dt}=E\sin\omega t$
C	$L\frac{di}{dt}+Ri=0$
D	$L\frac{di}{dt}+Ri=E\sin\omega t$
Ans	**D**
Marks	**1**
Unit	**IIe**

6	In a circuit containing resistance R and inductance L in series with constant voltage source E current i is given by $i=\frac{E}{R}\left(1-e^{-\frac{R}{L}t}\right)$, then maximum current $i_{\max}$ is
A	$\frac{E}{R}$
B	$\frac{R}{E}$
C	ER
D	0
Ans	**A**
Marks	**1**
Unit	**IIe**

7	In a circuit containing resistance R and inductance L in series with constant voltage source E current i is given by $i=\frac{E}{R}\left(1-e^{-\frac{R}{L}t}\right)$ and $L=640H$, $R=250\,\Omega$, $E=500V$, then maximum current $i_{\max}$ is
A	1
B	2
C	$\frac{1}{2}$
D	3
Ans	**B**
Marks	**1**
Unit	**IIe**

8	In a circuit containing resistance R and inductance L in series with constant voltage source E current i is given by $i=\frac{E}{R}\left(1-e^{-\frac{R}{L}t}\right)$ and $L=640H$, $R=250\,\Omega$, $E=500V$, then 50% of maximum current is
A	1
B	2
C	$\frac{1}{2}$
D	3
Ans	**A**
Marks	**1**
Unit	**IIe**

9	The differential equation for the current i in an electric circuit containing resistance 100 ohm and an inductance of 0.5 henery connected in series with battery of 20 volts is
A	$0.5\frac{di}{dt}+100\ i=0$
B	$0.5\frac{di}{dt}+100\ i=20$
C	$100\frac{di}{dt}+0.5\ i=20$
D	$100\frac{di}{dt}+0.5R=0$
Ans	**B**
Marks	**1**
Unit	**IIe**

10	The differential equation for the current i in an electric circuit containing resistance $R=250$ ohm and an inductance of $L=640$ henery in series with an electromotive force $E=500$ volts is
A	$640\frac{di}{dt}+250\ i=0$
B	$250\frac{di}{dt}+640i=500$
C	$640\frac{di}{dt}+250\ i=500$
D	$250\frac{di}{dt}+640i=0$
Ans	**C**
Marks	**1**
Unit	**IIe**

11	A capacitor $C = 0.01$ farad in series with resistor $R = 20$ ohms is charged from battery $E = 10$ volts. If initially capacitor is completely discharged then differential equation for charge $q(t)$ is given by
A	$20\dfrac{dq}{dt} + \dfrac{q}{0.01} = 0; \qquad q(0) = 0$
B	$20\dfrac{dq}{dt} + 0.01q = 10; \qquad q(0) = 0$
C	$20\dfrac{dq}{dt} + \dfrac{q}{0.01} = 10; \qquad q(0) = 0$
D	$20\dfrac{dq}{dt} + 0.01q = 0; \qquad q(0) = 0$
Ans	**C**
Marks	**1**
Unit	**IIe**

12	In a circuit containing resistance R and inductance L in series with constant voltage source E current i is given by $i = \dfrac{E}{R}\left(1 - e^{-\frac{R}{L}t}\right)$, $R = 100\,\Omega, E = 20V$, $L = 0.5H$ then the value of i at $t = 0$ is
A	$\dfrac{1}{5}$
B	$-\dfrac{1}{5}$
C	$\dfrac{2}{5}$
D	0
Ans	**D**
Marks	**1**
Unit	**IIe**

Type: One Dimensional Conduction of Heat

1	Fourier law of heat conduction states that, the quantity of heat flow across an area A cm^2 is
A	proportional to product of area A and temperature gradient $\frac{dT}{dx}$
B	inversely proportional to product of area A and temperature gradient $\frac{dT}{dx}$
C	equal to sum of area A and temperature gradient $\frac{dT}{dx}$
D	equal to difference of area A and temperature gradient $\frac{dT}{dx}$
Ans	**A**
Marks	**1**
Unit	**IIe**

2	If q be the quantity of heat that flows across an area A cm^2 and thickness δx in one second where the difference of temperature at the faces is δT, then by Fourier's law of heat conduction
A	$q=-k\left(A-\frac{dT}{dx}\right)$, where k is thermal conductivity
B	$q=kA\frac{dT}{dx}$, where k is thermal conductivity
C	$q=-k\left(A+\frac{dT}{dx}\right)$, where k is thermal conductivity
D	$q=-kA\frac{dT}{dx}$, where k is thermal conductivity
Ans	**D**
Marks	**1**
Unit	**IIe**

3	The differential equation for steady state heat loss per unit time from a unit length of pipe with thermal conductivity k radius r_0 carrying steam at temperature T_0, if the pipe is covered with insulation of thickness w, the outer surface of which remains at the constant temperature T_1, is
A	$Q = k(2\pi r)\frac{dT}{dr}$
B	$Q = -k(2\pi r)\frac{dT}{dr}$
C	$Q = -k(2\pi r^2)\frac{dT}{dr}$
D	$Q = -k(\pi r^2)\frac{dT}{dr}$
Ans	**B**
Marks	**1**
Unit	**IIe**

4	The differential equation for steady state heat loss per unit time from a spherical shell with thermal conductivity k radius r_0 carrying steam at temperature T_0, if the spherical shell is covered with insulation of thickness w, the outer surface of which remains at the constant temperature T_1, is
A	$Q = -k(2\pi r)\frac{dT}{dr}$
B	$Q = k(2\pi r)\frac{dT}{dr}$
C	$Q = -k(4\pi r^2)\frac{dT}{dr}$
D	$Q = -k(\pi r^2)\frac{dT}{dr}$
Ans	**C**
Marks	**1**
Unit	**IIe**

ENGINEERING MATHEMATICS – II

1. ORDINARY DIFFERENTIAL EQUATION

Sr.	Question
Q .1	The solution of the D.E. $\frac{dy}{dx} = 0$ is y = …………………
	a)X b) x^2 c) c d) x + c
Q .2	The solution of the D.E. $y\frac{dy}{dx} = x$ is ……………
	a)xy = c b) $x^2 - y^2$ =c c) x y^2 =c d) x^2y = c .
Q .3	The solution of the differential equation $\frac{dy}{dx} = e^{x-y}$ is
	a) y = e^x + c b) x = e^y + c c) x = log y +c d) $e^y = e^x + c$
Q. 4	Integrating factor of $\frac{dy}{dx} = -\frac{y}{1+x^2} + x^2$ is ………..
	a) $\sin^{-1} x$ b) $\tan^{-1} x$ c) $e^{\sin^{-1} x}$ d) $e^{\tan^{-1} x}$
Q. 5	Integrating factor of $\sqrt{1-x^2}\,.\frac{dy}{dx} + y = 1$ is
	a) $\sin^{-1} x$ b) $e^{\sin^{-1} x}$ c) $\tan^{-1} x$ d) $e^{\tan^{-1} x}$
Q .6	Integrating factor of (1+ y^2) dx = ($\tan^{-1}$ y – x) dy is ………………
	a) $\tan^{-1} x$ b) $\tan^{-1} y$ c) $e^{\tan^{-1} y}$ d) $e^{\tan^{-1} x}$
Q .7	The necessary and sufficient condition for M dx + N dy = 0 to be exact is …..
	a) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$ b) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$ c) $\frac{dM}{dy} = \frac{dN}{dx}$ d) $\frac{dM}{dx} = \frac{dN}{dy}$
Q .8	Integrating factor of $\frac{dx}{dy} + P'\,x = Q'$ where P^1 and Q^1 are functions of y only is …….
	a) $e^{\int P' dx}$ b) $e^{\int Q' dy}$ c) $e^{\int P' dy}$ d) $e^{\int Q' dx}$
Q .9	The equation of the form ……Is called Bernoulli's equation where P, Q are function of x only.
	a) $\frac{dy}{dx} + P\,y = Q\,y^n$ b) $\frac{dy}{dx} + P\,y = Q$ c) $\frac{dy}{dx} + Q = P\,y$ d) $\frac{dy}{dx} + P\,x = Q\,x^n$
Q.10	Integrating factor of (x + y) (dx – dy) = dx + dy is …………..
	a) $\frac{1}{x-y}$ b) $\frac{1}{x+y}$ c) $e^{\int x\,dx}$ d) $e^{\int Y\,dy}$
Q.11	If $\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)/N$ is a function of x only, say f(x) then the integrating factor of M dx + N dy = 0 is
	$a)$ $e^{\int M\,dx}$ b) $e^{\int N\,dy}$ c) $e^{\int f(x)\,dx}$ d) $e^{\int f(y)\,dy}$
Q.12	The integrating factor of $\frac{dy}{dx} = -\frac{x+y\cos x}{1+\sin x}$ is ……………..
	a)1 + cos x b) sin x + cos x c) 1 + sin x d) 1 – cos x
Q.13	Integrating factor of $\cos^2$ x $\frac{dy}{dx} + y = \tan x$ is ………..
	a) e^{tanx} b) $e^{sec^2 x}$ c) $e^{cos^2 x}$ d) none of these
Q.14	Integrating factor of (x + 1) $\frac{dy}{dx} - y = e^{3x}(1+x)^2$ is ……………
	a)x + 1 b) log (x+1) c) 1 /(x+1) d) $e^{(x+1)}$
Q.15	The equation M dx + N dy = 0 is said to be exact if ……………….
	a) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$ b) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$ c) $\frac{\partial^2 M}{\partial x \partial y} = \frac{\partial^2 M}{\partial y \partial x}$ d) $\frac{\partial^2 N}{\partial x \partial y} = \frac{\partial^2 N}{\partial y \partial x}$
Q.16	The equation (x – 3y + 4) dy – (2x – 6y +7) dx =0 is ……….. Equation.

	a) Homogeneous b) variable separable c) non-homogeneous d) exact
Q.17	The degree of the D.E. $(d^2y/dx^2)^2 + (dy/dx)^3 = (\sin x)^5$ is ....
	a) 2 b) 3 c) 5 d) 10
Q.18	In the D.E. $\frac{dy}{dx} + Py = Q$, where P and Q are functions of y only the I.F =
	a) $e^{\int P\,dx}$ b) $e^{\int P\,dy}$ c)) $e^{\int Q\,dx}$ d)) $e^{\int Q\,dy}$
Q.19	The eq. Mdx + Ndy = 0,where M is a function of x and N is a function of y only is ...
	a)Homogeneous b) variable separable c) linear d)Bernoulli's
Q.20	The solution of the D.E. x dx + y dy = 0 is ……….
	a) $xy = c$ b) $x + y = c$ c) $x^2 y^2 = c$ d) $x^2 + y^2 = c$
Q.21	The homogeneous D.E. M dx+N dy=0 can be reduced to a D.E. in which variables are separable by the substitution
	a)x+y=v b) xy=v c)x-y=c d) y=vx
Q.22	If P and Q are the functions of x alone, then the solution of D.E. $\frac{dy}{dx}$+Py=Q is
	a) $y=e^{\int P\,dx}\int Q\,e^{\int P\,dx}dx$ + c b) $ye^{\int P\,dx} = \int Q\,e^{\int P\,dx}dx$ + c c) $y=\int Q\,e^{\int P\,dx}dx$ + c d) $ye^{\int P\,dx} = \int e^{\int P\,dx}dx$ + c
Q.23	The necessary and sufficient condition for the D.E. M(x,y)dx+N(x,y)dy=0 to be exact is..
	a) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$ b) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$ c) $\frac{\partial^2 M}{\partial x\partial y} = \frac{\partial^2 M}{\partial y\partial x}$ d) M=N
Q.24	To solve the diff. equation $(2x+4y+1)\frac{dy}{dx}=(x+2y+2)$ we shall put
	a)y/x=v b)x=X+h y=Y+k c)2x+y=v d)x+2y=v
Q.25	$\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)/M$=10 then the integrating factor for the D.E. Mdx+Ndy=0 will be
	a)10x b)10y c) e^{10x} d) e^{10y}
Q.26	The solution of the exact D.E. $(y\sin 2x)dx - (y^2+\cos^2 x)dy$ will be
	a) $-y/2 \cos 2x + y^3/3 = c$ b) $-y^2/2+xy^2=c$ c) $-y \cos 2x/2 - y^3/3 = c$ d) $y^2/2 + xy^2 = c$
Q.27	The integrating factor of the D.E. $dy/dx + 2xy/1+x^2=0$ is
	a) e^{-x} b)x c) $1+x^2$ d) $1/1+x^2$
Q.28	To Solve the D.E. (x-y-2)dx-(2x-2y-3)dy=0,we shall put
	a)y=vx b)x-y=v c)x+y=v d) $x=x_1+h$ $y=y_1+k$
Q.29	The solution in which the arbitrary constants take particular values satisfying the equation is called
	a)Particular solution b) singular solution c) non-singular solution d) particular integral
Q.30	The solution of $\frac{dx}{x}+\frac{dy}{y}=0$ is ...
	$a)\, xy = 0$ $b)\log(xy) = \log x + \log y$ $c)\, xy = c$ $d)\, x^2 + y^2 = c$

Q.31	The D.E. of the form $\frac{dy}{dx}=\frac{f_1(x)}{f_2(y)}$ is called …
	a) Homogeneous b) variable separable c) Linear d) non-linear
Q.32	The solution of $\frac{dy}{dx}=\frac{x}{y}$ is …
	$a)\, x^2-y^2=c$ $b)\, xy=c$ $c)\, \log(xy)=c$ $d)\, x+y=c$
Q.33	The solution of $\frac{dy}{dx}=\frac{e^x}{e^y}$ is …
	$a)\, e^x=e^{-y}+c$ $b)\, \frac{e^x}{e^y}=c$ $c)\, e^x-e^y=c$ $d)\, e^{x-y}=c$
Q.34	The D.E. $(x+y)dy+(5x-3y+8)dx=0$ is …
	a) Homogeneous b) variable separable c)Non-Homogeneous d) linear
Q.35	The solution of $\sin x\, dx+\cos y\, dy=0$
	$a)\, \sin 2x+\cos 2y=c$ $b)\, \sin y-\cos x=c$ $c)\, \sin x.\cos y=c$ $d)\, \sin x-\cos y=c$
Q.36	The D.E. $(3a^2x^2+by\cos x)dx+(2\sin x-4ay^3)dy=0$ Is Exact for…
	a)b=2 b) b=3 c)b=4 d)b=5
Q.37	An integrating factor of $ydx-xdy=0$ is…
	a) $\frac{x}{y}$ b) $\frac{y}{x}$ c) $\frac{1}{x^2y^2}$ d) $\frac{1}{x^2+y^2}$
Q.38	The order of the D.E. whose general solution is given $y=(c_1+c_2)\sin(x+c_3)+(c_4+c_5)e^{x+c_6}$ where c_1,c_2,c_3,c_4,c_5,c_6 are arbitrary constants is …
	a)3 b) 4 c)5 d)6
Q.39	The D.E. $\frac{dy}{dx}=\frac{y}{x}$ represents a family of …
	a)circles b) straight lines c) Ellipses d)Hyperbolas
Q.40	The D.E. $\frac{dy}{dx}=-\frac{y}{x}$ represents a family of …
	a)circles b) straight lines c) Ellipses d)Hyperbolas

Q.41	For the D.E. Mdx+Ndy=0 be exact the condition $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$ is
	a)Necessary b)sufficient c)Necessary & sufficient d) None of this
Q.42	For the D.E. $\frac{dx}{dt} = -kx^2$, the particular solution when x=a, t=0 is…
	$a)x = ae^{-kt}$ $b)\frac{1}{x} = \frac{1}{a} + kt$ $c)x = a(1-e^{-kt})$ $d)\frac{1}{x} = -\frac{1}{a} + kt$
Q.43	The Equation … is a linear differential equation
	$a)\frac{dy}{dx} + x^2 y = \sin y$ $b)\frac{dy}{dx} - \frac{y}{x} = \frac{\sin x}{x}$ $c)(1+y)\frac{dy}{dx} + \sin x = y$ $d)\frac{dy}{dx} + y(y+x) = x^2$
Q.44	The solution of the differential Equation $\frac{dy}{dx} = e^{-y}$ with x=0, y=0 is…
	$a)e^y = x+1$ $b)e^x = y+1$ $c)e^y = -x+1$ $d)e^x = -y+1$
Q.45	The solution of the D.E. $3y\frac{dy}{dx} + 2x = 0$ represents a family of…
	a)circles b) straight lines c) Ellipses d)Hyperbolas
Q.46	The D.E. $(y^2 e^{xy^2} + 6x)dx + (2xy\, e^{xy^2} - 4y)dy = 0$ is…
	a)Linear, Homogeneous & Exact b)non-linear, non-homogeneous & Exact c)non-linear, Homogeneous & Exact d)non-linear, non-homogeneous & Non Exact
Q.47	The D.E. $\frac{dy}{dx} = -\frac{x}{y}$ represents a family of ...
	a)circles b) straight lines c) Ellipses d)Hyperbolas
Q.48	The solution of the D.E. $y\frac{dy}{dx} = 2x-1$ satisfying y (1) =0is...
	$a)y = x^2 - x$ $b)y^2 = x^2 - x$ $c)y^2 = 2x^2 - 2x$ $d)$ none of this
Q.49	The D.E. $(x^4 e^x - 2mxy^2)dx + 4x^2 y\, dy = 0$ is exact then the value of m is…
	a)1 b)4 c)-1 d)-2
Q.50	The solution of D.E. $\frac{dy}{dx} = -\frac{x}{y}$ at $x=1, y=\sqrt{3}$ is...

	$a)x-y^2=-2$ $b)x+y^2=4$ $c)x^2-y^2=-2$ $d)x^2+y^2=4$
Q.51	The D.E. $(ax^2y+2y^2-7)dx+(x^3+bxy-8)dy=0$ is…
	a)a=3,b=1 b) a=3,b=4 c) a=4,b=3 d)a=1,b=3
Q.52	The integrating factor of $x\dfrac{dy}{dx}+y=e^x-xy$ is…
	$a)x\log x$ $b)x+e^x$ $c)xe^{-x}$ $d)xe^x$
Q.53	The factor which helps to convert non exact D.E. into exact D.E. is called
	a)multiplication factor b) differential factor c) integrating factor d)exact factor
Q.54	The equation $\dfrac{dy}{dx}=\dfrac{x-2y+5}{2x+y-1}$ is…
	a)Homogeneous b) non exact, non-homogeneous c) Exact ,Homogeneous d)None of This
Q.55	If c is a constant, the solution of $\dfrac{dy}{dx}=1+y^2$ is…
	$a)y=\sin(x+c)$ $b)y=\cos(x+c)$ $c)y=\tan(x+c)$ $d)y=e^x+c$
Q.56	If e^{ny^2} is an integrating factor of the D.E. $\dfrac{dy}{dx}+xy=e^{y^2/2}$ then the value of n is…
	a)-1 b)1 c)1/2 d)-1/2

ANSWER:

1.c	2.b	3.d	4.d	5.b	6.c	7.b	8.c	9.a	10.b	11.c	12.c	13.a	14.c	15.b
16.c	17.a	18.b	19.b	20.d	21.d	22.b	23. b	24.d	25.d	26.c	27.c	28.b	29.a	30.c
31.b	32.a	33.c	34.c	35.b	36.a	37.b	38.d	39.b	40.d	41.c	42.b	43.a	44.a	45.c
46.b	47.a	48.c	49.d	50.d	51.b	52.d	53.c	54.d	55.c					

1.2. APPLICATIONS OF DIFFERENTIAL EQUATIONS

Sr.	Question
Q 1	Two curves are said to be orthogonal if the product of their slopes is equal to….
	(a) 0 (b) 1 (c) -1 (d) 2
Q 2	The orthogonal trajectories of the family of circles $x^2+y^2=a^2$ where a is a parameter are…
	(a) $y^2=mx$ (b) $y=mx$ (c) $y=mx^2$ (d) $y^2=x^2$
Q 3	Orthogonal trajectories of the family of parabolas $ay=x^2$ are….
	(a) circles (b) hyperbolas (c) ellipses (d) cubic parabolas
Q 4	The Orthogonal trajectories of the family of curves $xy=a$ is …
	(a) $x^2+y^2=c$ (b) $x^2-y^2=c$ (c) $x=cy$ (d) $y^2=4cx$
Q 5	The slope of the normal to the curve $y=x^2-2x+1$ at (0,1) is ….
	(a) 2 (b) -2 (c) ½ (d) – ½
Q 6	The angle between the curves $x^2+y^2=a^2$ and $y=mx$ for any value of a and m is equal to ….
	(a) 0 (b) π/2 (c) π/3 (d) π/4
Q 7	The orthogonal trajectory a of $r=a\theta$ is
	a)$c\,e^{\frac{-\theta^2}{2}}$ b) $ce^{\frac{\theta}{2}}$ c) $ce^{\frac{\theta^2}{2}}$ d) $ce^{\frac{-\theta}{2}}$
Q 8	The orthogonal trajectories to the family of straight line $y=mx$ will be
	a)$xy=c$ b) $x^2+y^2=c$ c) $x^2-y^2=c$ d) $x+y=c$
Q9	The Orthogonal trajectories of the family of curves $x+y=a$ is
	a)$x+y=0$ b) $x^2+y^2=c$ c) $x-y=c$ d) $x^2-y^2=c$
Q.10	The orthogonal trajectories of a family of the curves $xy=a$ is
	a)$x^2+y^2=c$ b) $y^2=4cx$ c) $x=cy$ d) $x^2-y^2=c$

1 . c	2 . b	3 . c	4 . b	5. c	6 .b	7.a	8.b	9.b	10.d					

Unit III

Reduction Formulae

(Chapter - 4)

Reduction formulae :

1) $\int_0^{\pi/2} \cos^n x dx = \int_0^{\pi/2} \sin^n x dx$ (Wallis formula)

$= \frac{[(n-1) \text{ subtract } 2 \ldots 2 \text{ or } 1]}{[(n) \text{ subtract } 2 \ldots 2 \text{ or } 1]} \times \left(\frac{\pi}{2} \text{ if n is even}\right)$

2) $\int_0^{\pi/2} \sin^m \cos^n x dx = \left\{\frac{[(m-1) \text{ subtract } 2 \ldots 2 \text{ or } 1]\,[(n-1) \text{ subtract } 2 \ldots 2 \text{ or } 1]}{[(m+n) \text{ subtract } 2 \ldots 2 \text{ or } 1]}\right\}$

$\times \left(\frac{\pi}{2} \text{ if m, n both even}\right)$

$= \left\{\frac{[(m-1) \text{ subtract } 2 \ldots 2 \text{ or } 1]\,[(n-1) \text{ subtract } 2 \ldots 2 \text{ or } 1]}{[(m+n) \text{ subtract } 2 \ldots 2 \text{ or } 1]}\right\}$

$\times (1)$ otherwise

3) $\int_0^{\pi/2} \sin^m x \cos x \, dx = \frac{1}{m+1}$

4) $\int_0^{\pi/2} \cos^m x . \sin x . dx = \frac{1}{m+1}$

Conversion formulae :

1) $\int_0^{2\pi} \sin^m x . \cos^n x dx = \begin{cases} = 4\int_0^{\pi/2} \sin^m x . \cos^n x \, dx & \text{if m, n even} \\ = 0 & \text{otherwise} \end{cases}$

2) $\int_0^{\pi} \sin^m x \cos^n x dx =$

$\begin{cases} = 2\int_0^{\pi/2} \sin^m x . \cos^n x \, dx & \text{if n even for any m} \\ = 0 & \text{if n is odd} \end{cases}$

3) $\int_0^{2\pi} \sin^n x dx = \begin{cases} = 4\int_0^{\pi/2} \sin^n x \, dx & \text{if n even} \\ = 0 & \text{if n odd} \end{cases}$

4) $\int_0^{2\pi} \cos^n x dx = \begin{cases} = 4\int_0^{\pi/2} \cos^n x \, dx & \text{if n even} \\ = 0 & \text{if n odd} \end{cases}$

5) $\int_0^{\pi} \sin^n x dx = 2\int_0^{\pi/2} \sin^n x \, dx$ for any n.

i.e for all values of n.

6) $\int_0^{\pi} \cos^n x dx = \begin{cases} = 2\int_0^{\pi/2} \cos^n x \, dx & \text{if n even.} \\ = 0 & \text{if n odd} \end{cases}$

Objective Questions & Answers for Online Examination

Q.1 The formula for the integral $\int_0^{\pi/2} \sin^n x \, dx$, if n is even, is ______.

a) $\left(\frac{n-1}{n}\right)\left(\frac{n-3}{n-2}\right)\left(\frac{n-5}{n-4}\right) \ldots\ldots \frac{3}{4} \cdot \frac{1}{2} \frac{\pi}{2}$

b) $\left(\frac{n-1}{n}\right)\left(\frac{n-3}{n-2}\right)\left(\frac{n-5}{n-4}\right) \ldots\ldots \frac{6}{7} \cdot \frac{4}{5} \cdot \frac{2}{3} \cdot 1$

c) $\left(\frac{n}{n-1}\right)\left(\frac{n-2}{n-3}\right)\left(\frac{n-4}{n-5}\right) \ldots\ldots \frac{4}{3} \cdot 2 \cdot \frac{2}{\pi}$

d) none of these **[Ans. : a]**

Q.2 The formula for the integral $\int_0^{\pi/2} \cos^n x \, dx$ for odd n, is ______.

a) $\left(\frac{n-1}{n}\right)\left(\frac{n-3}{n-2}\right) \ldots \left(\frac{3}{4}\right)\left(\frac{1}{2}\right)\left(\frac{\pi}{2}\right)$

b) $\left(\frac{n-1}{n}\right)\left(\frac{n-3}{n-2}\right) \ldots \left(\frac{6}{7}\right)\left(\frac{4}{5}\right)\left(\frac{2}{3}\right)(1)$

c $\left(\frac{n}{n-1}\right)\left(\frac{n-2}{n-3}\right)\cdots\left(\frac{4}{3}\right)\left(\frac{1}{2}\right)\left(\frac{2}{\pi}\right)$

d None of these [Ans. : b]

Q.3 If $U_n = \int_0^{\pi/2} \sin^n x\,dx$ and $U_n = \frac{n-1}{n} U_{n-2}$ then the value of U_4 is ______.

a $\frac{\pi}{4}$ b $\frac{3\pi}{4}$

c $\frac{3\pi}{8}$ d $\frac{\pi}{8}$ [Ans. : c]

Q.4 If $I_n = \int \sin^n x\,dx$ and $I_n = -\frac{\sin^{n-1}x\cos x}{n} + \frac{n-1}{n} I_{n-2}$ then the value of $\int_0^{\pi/4} \sin^2 dx$ is ______.

a $-\frac{1}{4}+\frac{\pi}{8}$ b $\frac{\pi}{8}$

c $-\frac{1}{2}+\frac{\pi}{4}$ d $-\frac{\pi}{4}$ [Ans. : a]

Q.5 If $U_n = \int_0^{\pi/4} \tan^n x\,dx$ then the value of $U_{n-1}+U_{n+1}$ is ______.

a 1 b n

c $\frac{2}{n}$ d $\frac{1}{n}$ [Ans. : d]

Q.6 If $I_n = \int_{\pi/4}^{\pi/2} \cot^n x\,dx$ and $I_n = \frac{1}{n-1} - I_{n-2}$, then the value of I_6 is ______.

a $\frac{13}{15}$ b $\frac{13}{15}-\frac{\pi}{4}$

c $\frac{13}{15}+\frac{\pi}{4}$ d $\frac{13}{15}-\frac{\pi}{2}$ [Ans. : b]

Q.7 If $I_n = \int_0^{\pi/2} \cos^n x \cos nx\,dx$ and $I_n = \frac{1}{2} I_{n-1}$, then the value of I_n is ______.

a $\frac{\pi}{2}$ b $\frac{\pi}{2^n}$

c $\frac{\pi}{2^{n+1}}$ d None of these [Ans. : c]

Q.8 If $I_n = \int_0^{\pi/2} \cos^n x \cos nx\,dx$ and $I_n = \frac{1}{2} I_{n-1}$ then the value of I_4 is ____.

a $\frac{\pi}{8}$ b $\frac{\pi}{16}$

c $\frac{\pi}{32}$ d $\frac{\pi}{4}$ [Ans. : c]

Q.9 If $U_n = \int_0^{\pi} \frac{\sin nx}{\sin x} dx = U_{n-2}$, then the value of U_n is ______.

a 0 b 1

c π d 2^n [Ans. : a]

Q.10 If $I_n = \int_0^{\pi/4} \frac{\sin(2n-1)x}{\sin x} dx$ and $n(I_{n+1}-I_n) = \sin\left(\frac{n\pi}{2}\right)$ then the value of I_3 is ______.

a 1 b $\frac{\pi}{4}$

c $1-\frac{\pi}{4}$ d $1+\frac{\pi}{4}$ [Ans. : d]

Q.11 If $I_n = \int_0^{\pi/2} x\sin^n x\,dx = \frac{1}{n^2}+\frac{n-1}{n} I_{n-2}$, then the value of I_3 is ______.

a $\frac{1}{9}$ b $\frac{7}{9}$

c $\frac{6}{9}$ d $\frac{5}{9}$ [Ans. : b]

Q.12 The value of the integral $\int_0^{\pi/2} \sin^m x \cos x\,dx$ is ______.

a $\frac{1}{m}$ b $\frac{-1}{m}$

c $\frac{-1}{m+1}$ d $\frac{1}{m+1}$ [Ans. : d]

Q.13 If $I_n = \int_0^{\pi/2} \sin^n x\,dx$ and $I_3 = \frac{2}{3} I_1$ then the value of I_3 is ______.

a $\frac{2}{3}$ b $\frac{4}{3}$

c $\frac{5}{3}$ d 1 [Ans. : a]

Q.14 If $I_n = \int_0^{\pi/4} \tan^n x\,dx$ then the reduction formula is ______.

a $I_n = -I_{n-2}$ b $I_n = 1-I_{n-2}$

c $I_n = \frac{1}{n-1} - I_{n-2}$

d $I_n = I_{n-1}$ **[Ans. : c]**

Q.15 If $I_n = \int [\log x]^n \, dx$ then the reduction formula is ____.

a $I_n + n\, I_{n-1} = x[\log x]^n$

b $I_n + n\, I_{n-1} = 0$

c $I_n - n\, I_{n-1} = 0$

d $I_n + n\, I_{n-2} = 0$ **[Ans. : a]**

Q.16 If $I_n = \int_0^\infty e^{-x} \sin^n x \, dx = \frac{n(n-1)}{n^2+1} I_{n-2}$ then the value of I_2 is ____.

a $\frac{2}{5}$ b $-\frac{2}{5}$

c $\frac{1}{5}$ d $-\frac{1}{5}$ **[Ans. : a]**

Q.17 If $I_n = \int_0^{\pi/2} x \cos^n x \, dx = -\frac{1}{n^2} + \frac{n-1}{n} I_{n-2}$, then the value of I_2 is ____.

a $-\frac{1}{4} + \frac{\pi^2}{16}$ b $\frac{\pi^2}{16} + \frac{1}{4}$

c $\frac{\pi^2}{4} + 1$ d $\frac{\pi^2}{4} - 1$ **[Ans. : a]**

Q.18 The value of I_0, if $I_n = \int_0^{\pi/2} \cos^n x \cos nx \, dx$, is ____.

a 0 b $\frac{\pi}{2}$

c π d $\frac{1}{2}$ **[Ans. : b]**

Q.19 If $I_n = \int_0^{\pi/2} \sin^n x \, dx = \frac{n-1}{n} I_{n-2}$ then the value of I_2 is ____.

a $\frac{\pi}{2}$ b $\frac{\pi}{4}$

c $-\frac{\pi}{2}$ d $-\frac{\pi}{4}$ **[Ans. : b]**

Q.20 If $I_n = \int_0^{\pi/2} \sin^n x \, dx = \frac{n-1}{n} I_{n-2}$, then the value of I_3 is ____.

a 1 b $\frac{1}{3}$

c $\frac{2}{3}$ d $\frac{4}{3}$ **[Ans. : c]**

Q.21 If $I_n = \int_0^{\pi/4} \frac{\sin(2n-1)x}{\sin x} dx$ and $n(I_{n+1} - I_n) = \sin\left(\frac{n\pi}{2}\right)$ then the value of I_2 is ____.

a 1 b $1 + \frac{\pi}{4}$

c $\frac{\pi}{4}$ d $1 - \frac{\pi}{4}$ **[Ans. : b]**

Q.22 If $I_n = \int [\log x]^n dx = x[\log x]^n - n\, I_{n-1}$, then the value of I_1 is ____.

a $x \log x - x$ b $x \log x$

c $x \log x + x$ d None of these **[Ans. : a]**

Q.23 If $U_n = \int_0^{\pi/4} \tan^n x \, dx$ and $U_{n+1} = \frac{1}{n} - U_{n-1}$ then the value of $U_2 + U_0$ is ____.

a 0 b 1

c 2 d -1 **[Ans. : b]**

Q.24 If $I_n = \int_0^{\pi/3} \cos^n x \, dx = \frac{\sqrt{3}}{n\, 2^n} + \frac{n-1}{n} I_{n-2}$ then the value of I_2 is ____.

a $\frac{\sqrt{3}}{8} + \frac{\pi}{6}$ b $\frac{\pi}{6}$

c $\frac{\sqrt{3}}{8} - \frac{\pi}{6}$ d None of these **[Ans. : a]**

Q.25 If $I_n = \int_0^{\pi/4} \sec^n x \, dx$ and $I_n = \frac{(\sqrt{2})^{n-2}}{n-1} + \left(\frac{n-2}{n-1}\right) I_{n-2}$ then the value of I_2 is ____.

a 0 b $\frac{1}{\sqrt{2}}$

c $\frac{1}{2}$ d 1 **[Ans. : d]**

Q.26 The value of the integral $\int_0^{\pi/2} \sin^7 x \cos^4 x \, dx$ is ____.

a $\frac{16}{115}$ b $\frac{16}{1155}$

c $\frac{1}{1155}$ d $\frac{16}{110}$ **[Ans. : b]**

Q.27 The value of the integral $\int_0^{\pi/2} \cos^2 \theta \sin^8 \theta \, d\theta$ is ____.

a $\frac{35\pi}{2560}$ b $\frac{\pi}{256}$

c $-\frac{\pi}{256}$ d 0 [Ans. : a]

Q.28 The value of the integral $\int_0^{\pi/2} \sin^6 x \, dx$ is ______.

a $\frac{\pi}{8}$ b $\frac{5\pi}{32}$

c $\frac{\pi}{32}$ d $\frac{3\pi}{8}$ [Ans. : b]

Q.29 The value of integral $\int_0^{\pi/2} \cos^8 x \, dx$ is ______.

a $\frac{35\pi}{256}$ b $\frac{\pi}{256}$

c $\frac{35}{256}$ d $\frac{256}{35}$ [Ans. : a]

Q.30 The value of the integral $\int_0^{\pi/2} \cos^n x \, dx$ is equal to ______.

a $3\int_0^{\pi/4} \cos^n dx$ b $2\int_0^{\pi/2} \sin^n x \, dx$

c $\int_0^{\pi/2} \sin^n x \, dx$ d None of these [Ans. : c]

□□□

Seat No -

Total number of questions : 60

1000505 T1 ENGINEERING MATHEMATICS II

Time : 1hr

Max Marks : 50

N.B

1) All questions are Multiple Choice Questions having single correct option.

2) Attempt any 50 questions out of 60.

3) Use of calculator is allowed.

4) Each question carries 1 Mark.

5) Specially abled students are allowed 20 minutes extra for examination.

6) Do not use pencils to darken answer.

7) Use only black/blue ball point pen to darken the appropriate circle.

8) No change will be allowed once the answer is marked on OMR Sheet.

9) Rough work shall not be done on OMR sheet or on question paper.

10) Darken ONLY ONE CIRCLE for each answer.

Q.no 1. To change Cartesian coordinates (x, y, z) to spherical polar coordinate (r, θ, ϕ);$dxdydz$ is replaced by

A : To change Cartesian coordinates (x, y, z) to spherical polar coordinate (r, θ, ϕ);$dxdydz$ is replaced by

B : $r^2 \cos\theta dr d\theta d\phi$

C : $r^2 dr d\theta d\phi$

D : $r dr d\theta d\phi$

Q.no 2. Moment of inertia of the lamina A about the x axis is equal to

A : $\int\int_A \rho x^2 dxdy$

B : $\int \int_A \rho y^2 dxdy$

C : $\int \int_A \rho(x^2 + y^2)dxdy$

D : $\int \int_A \rho x^2 y^2 dxdy$

Q.no 3. Rectilinear motion is a motion of body along a

A : Straight line

B : Circular path

C : Parabolic path

D : Hyperbolic path

Q.no 4. If $\phi(a) = \int_0^\infty e^{-bx^2} \cos(2ax)\,dx,\ b > 0$ then by DUIS rule $\frac{d\phi}{da}$ is

A : $\int_0^\infty \frac{\partial}{\partial b}\left[e^{-bx^2} \cos(2ax)\right]dx$

B : $e^{-bx^2} \cos(2ax)$

C : $\int_0^\infty \frac{\partial}{\partial x}\left[e^{-bx^2} \cos(2ax)\right]dx$

D : $\int_0^\infty \frac{\partial}{\partial a}\left[e^{-bx^2} \cos(2ax)\right]dx$

Q.no 5. The differential equation for the current i in an electric circuit containing resistance 100 ohm and an inductance of 0.5 henery connected in series with battery of 20 volts is

A : $0.5\frac{di}{dt} + 100i = 0$

B : $0.5\frac{di}{dt} + 100i = 20$

C : $100\frac{di}{dt} + 0.5i = 0$

D : $100\frac{di}{dt} + 0.5R = 0$

Q.no 6. The formula to find the length of the curve $y = f(x)$ from $x = a$ to $x = b$ is $s =$

A : $\int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dx$

B : $\int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dy$

C : $\int_a^b \sqrt{a^2 + \left(\frac{dy}{dx}\right)^2}\, dx$

D : $\int_a^b \sqrt{a^2 + b^2\left(\frac{dy}{dx}\right)^2}\, dy$

Q.no 7.
Condition for the two spheres $x^2 + y^2 + z^2 + 2u_1x + 2v_1y + 2w_1z + d_1 = 0$ and $x^2 + y^2 + z^2 + 2u_2x + 2v_2y + 2w_2z + d_2 = 0$ to be orthogonal is ---

A : $S + \lambda U = 0$

B : $S_1 - S_2 = 0$

C : $2u_1u_2 + 2v_1v_2 + 2w_1w_2 = d_1 + d_2$

D : $u_1u_2 + v_1v_2 + w_1w_2 = d_1 + d_2$

Q.no 8. The general solution of Linear Differential equation $\frac{dx}{dy} + Px = Q$ where P and $Q$are functions of y or constants, is

A : $x\, e^{\int p dx} = \int Q\, e^{\int p dx} dx + c$

B : $x\, e^{\int p dy} = \int Q\, e^{\int p dy} dy + c$

C : $y\, e^{\int p dx} = \int Q\, e^{\int p dx} dx + c$

D : $y\, e^{\int p dx} = \int Q\, e^{\int p dx} dy + c$

Q.no 9. The necessary and sufficient condition that the Differential equation $Mdx + Ndy = 0$ is exact is

A : $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$

B : $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$

C : $\frac{\partial M}{\partial y} \neq \frac{\partial N}{\partial x}$

D : $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial x}$

Q.no 10. Fourier law of heat conduction states that, the quantity of heat flow across an area A cm2 is

A : proportional to product of area A and temperature gradient dT/dx

B : inversely proportional to product of area A and temperature gradient dT/dx

C : equal to sum of area A and temperature gradient

D : equal to difference of area A and temperature gradient dT/dx

Q.no 11.

Fourier series representation of periodic function $f(x)$ with period 2π which satisfies the Dirichlet's conditions is

A : $\frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos nx + b_n \sin nx)$

B : $\frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos n\pi x + b_n \sin n\pi x)$

C : $\frac{a_0}{2}+\sum_{n=1}^{\infty}(a_n \cos nx)(b_n \sin nx)$

D : $\frac{a_0}{2}+(a_n \cos nx + b_n \sin nx)$

Q.no 12. The integrating factor of $(y^4+2y)dx+(xy^3+2y^4-4x)dy=0$ using non exact rule $\frac{\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)}{M}$ is

A : $\frac{1}{y^3}$

B : 1/x

C : y^3

D : $\frac{1}{x^3}$

Q.no 13. A circuit containing inductance L capacitance C in series without applied electromotive force. By Kirchhoff's voltage law differential equation for current i is

A : $L\frac{di}{dt}+\frac{q}{c}=0$

B : $L\frac{di}{dt}+Ri=0$

C : $L\frac{di}{dt}+Ri=E$

D : $L\frac{di}{dt}+\frac{q}{c}=E$

Q.no 14. $\int_0^{\pi/2} sin^p\theta \, cos^q\theta \, d\theta$ is equal to

A : $B\left(\frac{p-1}{2},\frac{q-1}{2}\right)$

B : $\frac{1}{2}B\left(\frac{p+1}{2},\frac{q+1}{2}\right)$

C : $B\left(\frac{p+1}{2},\frac{q+1}{2}\right)$

D : $B(p,q)$

Q.no 15. The integrating factor of $\frac{dy}{dx}+Py=Q$ is

A : $e^{\int p dx}$

B : $e^{\int p dy}$

C : $e^{\int Q dx}$

D : $e^{\int Q dy}$

Q.no 16. Error function of x, $erf\left(x\right)$ is defined as

A : $\frac{2}{\sqrt{\pi}}\int_0^x e^{-u^2}du$

B : $\frac{2}{\sqrt{\pi}}\int_x^\infty e^{-u^2}du$

C : $\int_0^\infty e^{-x}x^{n-1}dx$

D : $\frac{2}{\sqrt{\pi}}\int_0^\infty e^{-u^2}du$

Q.no 17. The differential equation for the current in an electric circuit containing resistance R and inductance L in series with voltage source E sin(wt) is

A : $L\frac{di}{dt}+\frac{q}{C}=E$

B : $Li + R\frac{di}{dt} = Esin\omega t$

C : $L\frac{di}{dt} + Ri = 0$

D : $L\frac{di}{dt} + Ri = 0$

Q.no 18. Moment of inertia of the lamina A about the y axis is equal to

A : $\int \int_A \rho x^2 dxdy$

B : $\int \int_A \rho y^2 dxdy$

C : $\int \int_A \rho(x^2 + y^2) dxdy$

D : $\int \int_A \rho x^2 y^2 dxdy$

Q.no 19. The solution of the DE $\frac{dy}{dx} = \frac{x^2}{y^3}$ is

A : $y^3 - x^3 = c$

B : $3y^4 - 4x^3 = c$

C : $y^2 - x^3 = c$

D : $x^2 - y^2 = c$

Q.no 20. If the differential equation $M(x,y)dx + N(x,y)dy = 0$ is not exact and it can be written as $yf_1(x,y)dx + xf_2(x,y)dy = 0$ then integrating factor is

A : $\frac{1}{My + Nx}; My + Nx \neq 0$

B : $\frac{1}{Mx+Ny}$; $Mx+Ny \neq 0$

C : $\frac{1}{Mx-Ny}$; $Mx-Ny \neq 0$

D : $\frac{1}{My-Nx}$; $My-Nx \neq 0$

Q.no 21. The integrating factor of the DE $cosx\frac{dy}{dx}+ysinx=1$ is

A : sec x

B : cot x

C : tan x

D : sin x

Q.no 22. If double integral in Cartesian coordinate is given by $\int\int_R f(x,y)\,dxdy$ then the value of same integral in polar form is

A : $\int\int_R f(r\cos\theta, r\sin\theta)\,rdrd\theta$

B : $\int\int_R f(r\cos\theta, r\sin\theta)\,rdrd\theta$

C : $\int\int_R f(r\cos\theta, r\sin\theta)\,r^2drd\theta$

D : $\int\int_R f(r\sin\theta, r\cos\theta)\,rdrd\theta$

Q.no 23. A particle moving in straight line with acceleration $k(x+\frac{a^4}{x^3})$ directed towards origin. The equation of motion is

A : $\frac{dv}{dx}=-k(x+\frac{a^4}{x^3})$

B : $v\frac{dv}{dx}=k(x+\frac{a^4}{x^3})$

C : $v\frac{dv}{dx} = -k(x + \frac{a^4}{x^3})$

D : $\frac{dv}{dx} = (x + \frac{a^4}{x^3})$

Q.no 24. Area enclosed by the polar curve $r = f_1(\theta)$ and $r = f_2(\theta)$ and the line $\theta = \alpha, \theta = \beta \alpha < \beta$ is given by

A : $Area = \int_\alpha^\beta \int_{f_1(\theta)}^{f_2(\theta)} r dr d\theta$

B : $Area = \int_\alpha^\beta \int_{f_1(\theta)}^{f_2(\theta)} dr d\theta$

C : $Area = \int_\alpha^\beta \int_{f_1(\theta)}^{f_2(\theta)} r^2 \sin\theta dr d\theta$

D : $Area = \int_\alpha^\beta \int_{f_1(\theta)}^{f_2(\theta)} r^2 \cos\theta dr d\theta$

Q.no 25.

The equation of asymptotes parallel to y-axis to the curve represented by the equation

$y^2(4-x) = x(x-2)^2$ is

A : x=2

B : y=0

C : x=4

D : x=0

Q.no 26. The value of integration $\int_0^a \int_0^b \int_0^c x^2y^2z^2 dxdydz$ is equal to

A : $\frac{abc}{3}$

B : $\frac{a^2b^2c^2}{3}$

C : $\frac{a^3b^3c^3}{27}$

D : $\frac{a^2b^2c^2}{9}$

Q.no 27. The center and radius of the sphere $3(x^2 + y^2 + z^2) - 30x + 12y - 18z + 89 = 0$ is

A : (10,-4,6) , $\frac{5}{\sqrt{3}}$

B : (15,-6,9) , $\frac{\sqrt{203}}{\sqrt{3}}$

C : (5,-2,3) , $\frac{5}{\sqrt{3}}$

D : (-5,2,-3) , $\frac{5}{3}$

Q.no 28.
Find semi-vertical angle for a right circular cone with vertex at the point (1,0,1)which passes through the point (1,1,1) and axis of cone has direction ratios 1,1,1

A : $\sin\alpha = \frac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\sqrt{a_2^2 + b_2^2 + c_2^2}}$

B : $\cos\alpha = \frac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\sqrt{a_2^2 + b_2^2 + c_2^2}}$

C : $\cos\alpha = a_1a_2 + b_1b_2 + c_1c_2$

D : $\sin\alpha = a_1a_2 + b_1b_2 + c_1c_2$

Q.no 29. $erf(x) - erfc(x) = 1 \quad erfc(x) = ?$

A : $\frac{2}{\sqrt{\pi}}\int_0^x e^{-u^2}\,du$

B : $\frac{2}{\sqrt{\pi}}\int_x^\infty e^{-u^2}\,du$

C : $\frac{2}{\sqrt{\pi}}\int_0^{x^2} e^{-t}t^{-1/2}dt$

D : 0

Q.no 30. The integrating factor of the DE $\frac{dy}{dx} + ycosx = \frac{sin2x}{2}$ is

A : e^{cosx}

B : e^{sinx}

C : sin x

D : cos x

Q.no 31. According to D'Alembert's principle algebraic sum of forces acting on a body along a given direction is equal to

A : Velocity x Acceleration

B : Mass x Velocity

C : Mass x displacement

D : Mass x Acceleration

Q.no 32. If $I_n=\int_0^{\pi/2} sin^n x\, dx$, where n is positive even integer then I_n is calculated from

A : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}......\frac{3}{4}.\frac{1}{2}$

B : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}......\frac{3}{4}.\frac{1}{2}.\pi$

C : $\left(\frac{n+1}{n}.\frac{n.+3}{n+2.}.\frac{n+5}{n+4}\right)......\frac{\pi}{2}$

D : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}......\frac{3}{4}.\frac{1}{2}.\frac{\pi}{2}$

Q.no 33. The value of λ for which the differential equation $(xy^2+\lambda x^2y)dx+(x+y)x^2dy=0$ is exact

A : 2

B : -3

C : 3

D : -2

Q.no 34.

If $(\bar{x},\bar{y})$ the coordinates of centroid of the plane area is given by

A : $\bar{x}=\dfrac{\int\int x\rho dxdy}{\int\int \rho dxdy},\bar{y}=\dfrac{\int\int y\rho dxdy}{\int\int \rho dxdy}$

B : $\bar{x}=\dfrac{\int\int x^2\rho dxdy}{\int\int \rho dxdy},\bar{y}=\dfrac{\int\int y^2\rho dxdy}{\int\int \rho dxdy}$

C : $\bar{x}=\dfrac{\int\int \rho dxdy}{\int\int x\rho dxdy},\bar{y}=\dfrac{\int\int \rho dxdy}{\int\int y\rho dxdy}$

D : None of these

Q.no 35. The integrating factor of $(x^2+y^2+x)dx+xydy=0$ using non exact rule $\frac{\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)}{N}$ is

A : x

B : 1/x

C : x2

D : xy

Q.no 36. The formula to find the length of the curve $r=f(\theta)$ from $\theta=\theta_1$ to $\theta=\theta_2$ is

A : $\int_{\theta_1}^{\theta_2}\sqrt{1+\left(\frac{dr}{d\theta}\right)^2}\,d\theta$

B : $\int_{\theta_1}^{\theta_2} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\ d\theta$

C : $\int_{\theta_1}^{\theta_2} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\ dr$

D : $\int_{\theta_2}^{\theta_1} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\ d\theta$

Q.no 37. The value of $erf\,(3) + erf_C\,(3)$ is

A : 3

B : 2

C : 1

D : 0

Q.no 38. If the equation of curve remains unchanged by replacing y by -y, then the curve is symmetric about

A : y-axis

B : line y=x

C : x-axis

D : line y=-x

Q.no 39. If the sphere $x^2 + y^2 + z^2 = 25$,

$$x^2 + y^2 + z^2 - 18x - 24y - 40z + 225 = 0$$

touches each other externally then distance between their centers is:

A : 20

B : 5

C : 15

D : 25

Q.no 40. The integrating factor of the DE $\frac{dx}{dy} + \frac{3}{y}x = \frac{1}{y^2}$

A : $-y^3$

B : y^3

C : x^2y

D : x^3

Q.no 41. The integrating factor of $(3x^2y^4 + 2xy)dx + (2x^3y^3 - x^2)dy = 0$ using non exact rule $\frac{\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)}{M}$ is

A : y^2

B : $\frac{1}{y^2}$

C : y

D : 1/y

Q.no 42. The integrating factor for the DE $(1 + x^2)\frac{dy}{dx} + xy = 0$ is

A : e^{1+x^2}

B : $\log(x^2 + 1)$

C : $\sqrt{x^2 + 1}$

D : $1 + x^2$

Q.no 43.

The two spheres $x^2 + y^2 + z^2 - 12x - 18y - 24z + 29 = 0$ and $x^2 + y^2 + z^2 + 3x - 3y + 3z - 56 = 0$

A : touches each other internally

B : touches each other externally

C : touches each other Orthogonally

D : Intersecting each other

Q.no 44. Radius of right circular cylinder is 5and whose axis is the line $\frac{x-2}{3} = \frac{y-3}{1} = \frac{z+1}{1}$ Then the equation of right circular cylinder is

A : $(x+2)^2 + (y+3)^2 + (z+1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

B : $(x-2)^2 + (y-3)^2 + (z-1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

C : $(x+2)^2 + (y-3)^2 + (z+1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

D : $(x-2)^2 + (y-3)^2 + (z+1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

Q.no 45. q56.jpg

A : 1

B : 0

C : q56_3.jpg

D : q56_4.jpg

Q.no 46.

Area bounded by the parabola $y^2 = 4x$ and the line $y = x$ is calculated using

A : $\int_{y=0}^{4} \int_{x=y^2/4}^{y} dxdy$

B : $\int_{y=0}^{4} \int_{x=0}^{4} dxdy$

C : $\int_{y=0}^{4} \int_{x=0}^{y} dxdy$

D : $\int_{x=0}^{4} \int_{y=0}^{x} dxdy$

Q.no 47. The value of integration $\int_0^1 \int_0^x (x^2 + y^2)\, dxdy$ is equal to

A : 4/3

B : 5/3

C : 2/3

D : 1

Q.no 48. The value of integration $\int_0^1 \int_0^1 \int_0^1 xyzdxdydz$ is equal to

A : 0.125

B : 0.25

C : -0.125

D : 1

Q.no 49. The value of integration $\int_0^1 \int_0^{x^2} xe^y dxdy$ is equal to

A : e/2

B : e-1

C : 1-e

D : (e/2)-1

Q.no 50. $B\left(\frac{1}{4}, \frac{3}{4}\right)$ is equal to

A : $\frac{2\pi}{\sqrt{3}}$

B : $\frac{2\pi}{\sqrt{3}}$

C : 0

D : $\pi\sqrt{2}$

Q.no 51. A capacitor C=0.01 farad in series with resistor R=20 ohms is charged from battery E=10 volts. If initially capacitor is completely discharged then differential equation for charge q(t) is given by

A : $20\frac{dq}{dt}+\frac{q}{0.01}=0\ ;\ q(0)=0$

B : $20\frac{dq}{dt}+0.01q=10\ ;\ q(0)=0$

C : $20\frac{dq}{dt}+\frac{q}{0.01}=10\ ;\ q(0)=0$

D : $20\frac{dq}{dt}+0.01q=0\ ;\ q(0)=0$

Q.no 52. If $I(\alpha)=\int_0^1\frac{x^\alpha-1}{\log x}dx$, $\alpha\geq 0$ then by DUIS $\frac{dI}{d\alpha}$ is

A : $\int_0^1 \log x\, dx$

B : $\int_0^1 x^\alpha \log x\, dx$

C : $\int_0^1 x^\alpha dx$

D : $\int_0^1 x^{-\alpha} dx$

Q.no 53.

The equation of sphere which passes through the point (4, 6, 3) and passes through the circle $(x-1)^2+(y-2)^2=25$, $z=0$ is

A : $x^2+y^2+z^2-2x-4y-3z-20=0$

B : $x^2 + y^2 + z^2 + 3x - 4y + 3z - 16 = 0$

C : $2x^2 + 2y^2 + 2z^2 + 6x - 3y + 2z = 0$

D : $x^2 + y^2 + z^2 + 4x - 4y + 3z - 20 = 0$

Q.no 54. The solution of exact DE $(x + 2y - 2)dx + (2x - y + 3)dy = 0$ is

A : $x^2 + 4xy - 4x + 6y = c$

B : $x^2 + 4xy - 4x - y^2 + 6y = c$

C : $x^2 + 8xy + y^2 = c$

D : $x^2 + 4xy - \frac{y^2}{2} + y = c$

Q.no 55. If $I_n = \int_0^{\pi/2} cos^n x \, dx$ then which of the following relation is true?

A : $\frac{n-1}{n} \cdot \frac{n-3}{n-2.} \cdot \frac{n-5}{n-4} \cdots\cdots \frac{3}{4} \cdot \frac{1}{2}$

B : $I_n = \frac{n}{n-1} I_{n-2}$

C : $I_n = \frac{n-1}{n} I_{n-2}$

D : $I_n = n(n+1) I_{n-1}$

Q.no 56. In spherical co-ordinates volume is given by

A : $V = \int \int \int_V dr d\theta d\phi$

B : $V = \int \int \int_V r dr d\theta d\phi$

C : $V = \int \int \int_V r^2 \cos\theta dr d\theta d\phi$

D : $V = \int \int \int_V r^2 \sin\theta dr d\theta d\phi$

Q.no 57.
The radius of the circle of intersection of the sphere $x^2 + y^2 + z^2 - 2x + 4y + 2z - 6 = 0$ by the plane $x + 2y + 2z - 4 = 0$ is:

[Centre of the circle is(2,0,1)]

A : 9

B : 3

C : 12

D : $\sqrt{3}$

Q.no 58. The value of a_0 in harmonic analysis of y for the following tabulated data is

x	0	1	2	3	4	5	6
y	9	18	24	28	26	20	9

A : 17.85

B : 20.83

C : 35.71

D : 41.66

Q.no 59. $\frac{5\pi}{128}$

A : $\frac{5\pi}{128}$

B : $\frac{3\pi}{128}$

C : $\frac{3\pi}{512}$

D : $\frac{5\pi}{64}$

Q.no 60. The value of integration $\int_0^2 \int_0^{x^2} e^{\frac{y}{x}} dxdy$ is equal to

A : $e^2 - 2$

B : $2e^2 - 1$

C : $e^2 - 1$

D : $e^2 + 1$

Answer for Question No 1. is a

Answer for Question No 2. is b

Answer for Question No 3. is a

Answer for Question No 4. is d

Answer for Question No 5. is b

Answer for Question No 6. is a

Answer for Question No 7. is c

Answer for Question No 8. is b

Answer for Question No 9. is a

Answer for Question No 10. is a

Answer for Question No 11. is b

Answer for Question No 12. is a

Answer for Question No 13. is a

Answer for Question No 14. is b

Answer for Question No 15. is a

Answer for Question No 16. is a

Answer for Question No 17. is d

Answer for Question No 18. is a

Answer for Question No 19. is b

Answer for Question No 20. is c

Answer for Question No 21. is a

Answer for Question No 22. is a

Answer for Question No 23. is c

Answer for Question No 24. is a

Answer for Question No 25. is c

Answer for Question No 26. is c

Answer for Question No 27. is c

Answer for Question No 28. is b

Answer for Question No 29. is b

Answer for Question No 30. is b

Answer for Question No 31. is d

Answer for Question No 32. is d

Answer for Question No 33. is c

Answer for Question No 34. is a

Answer for Question No 35. is a

Answer for Question No 36. is b

Answer for Question No 37. is c

Answer for Question No 38. is c

Answer for Question No 39. is d

Answer for Question No 40. is b

Answer for Question No 41. is b

Answer for Question No 42. is b

Answer for Question No 43. is c

Answer for Question No 44. is d

Answer for Question No 45. is c

Answer for Question No 46. is a

Answer for Question No 47. is c

Answer for Question No 48. is a

Answer for Question No 49. is b

Answer for Question No 50. is d

Answer for Question No 51. is c

Answer for Question No 52. is c

Answer for Question No 53. is a

Answer for Question No 54. is b

Answer for Question No 55. is c

Answer for Question No 56. is d

Answer for Question No 57. is d

Answer for Question No 58. is d

Answer for Question No 59. is b

Answer for Question No 60. is c

Seat No -

Total number of questions : 60

1000505 T1 ENGINEERING MATHEMATICS II

Time : 1hr

Max Marks : 50

N.B

1) All questions are Multiple Choice Questions having single correct option.

2) Attempt any 50 questions out of 60.

3) Use of calculator is allowed.

4) Each question carries 1 Mark.

5) Specially abled students are allowed 20 minutes extra for examination.

6) Do not use pencils to darken answer.

7) Use only black/blue ball point pen to darken the appropriate circle.

8) No change will be allowed once the answer is marked on OMR Sheet.

9) Rough work shall not be done on OMR sheet or on question paper.

10) Darken ONLY ONE CIRCLE for each answer.

Q.no 1. In a D.E. $L\frac{di}{dt} + Ri = E$, E means

A : Voltage

B : Current

C : Resistance

D : Electromotive force

Q.no 2. $\int_0^{\pi/2} sin^p\theta cos^q\theta \, d\theta$ is equal to

A : $B\left(\frac{p-1}{2}, \frac{q-1}{2}\right)$

B : $\frac{1}{2}B\left(\frac{p+1}{2}, \frac{q+1}{2}\right)$

C : $B\left(\frac{p+1}{2},\frac{q+1}{2}\right)$

D : $B(p,q)$

Q.no 3. If q be the quantity of heat that flows across an area A cm2 and thickness δx in one second where the difference of temperature at the faces is δT, then by Fourier's law of heat conduction

A : $q=-k\left(A-\frac{dt}{dx}\right)$, where k is thermal conductivity

B : $q=kA\frac{dT}{dx}$, where k is thermal conductivity

C : $q=-k\left(A+\frac{dt}{dx}\right)$, where k is thermal conductivity

D : $q=-kA\frac{dT}{dx}$, , where k is thermal conductivity

Q.no 4. Moment of inertia of the lamina A about the x axis is equal to

A : $\int\int_A \rho x^2 dxdy$

B : $\int\int_A \rho y^2 dxdy$

C : $\int\int_A \rho(x^2+y^2)dxdy$

D : $\int\int_A \rho x^2 y^2 dxdy$

Q.no 5. According to D'Alembert's principle algebraic sum of forces acting on a body along a given direction is equal to

A : Velocity x Acceleration

B : Mass x Velocity

C : Mass x displacement

D : Mass x Acceleration

Q.no 6. The amount of heat Q flowing through the area per unit time is

A : Q = thermal conductivity x Area x Rate of change of temp. across an area

B : Q = thermal conductivity x Area of slab

C : Q = thermal conductivity x Area x temp. gradient

D : Q = thermal conductivity x Area + Rate of flow of heat

Q.no 7. Fourier law of heat conduction states that, the quantity of heat flow across an area A cm2 is

A : proportional to product of area A and temperature gradient dT/dx

B : inversely proportional to product of area A and temperature gradient dT/dx

C : equal to sum of area A and temperature gradient

D : equal to difference of area A and temperature gradient dT/dx

Q.no 8. If the equation of curve remains unchanged by replacing y by -y, then the curve is symmetric about

A : y-axis

B : line y=x

C : x-axis

D : line y=-x

Q.no 9. Equation of right circular cylinder whose radius is 'r' and axis is the line $\frac{x}{l} = \frac{y}{m} = \frac{z}{n}$ is

A : $x^2 + y^2 + z^2 = r^2 + \left(\frac{lx + my + nz}{\sqrt{l^2 + m^2 + n^2}}\right)^2$

B : $\alpha = \cos^{-1} 1$

C : $x^2 + y^2 + z^2 = r^2 + \frac{lx + my + nz}{\sqrt{l^2 + m^2 + n^2}}$

D : $(x + y + z) = r^2 + \left(\frac{lx + my + nz}{\sqrt{l^2 + m^2 + n^2}}\right)^2$

Q.no 10.

The equation of tangent to the curve at origin represented by the equation $y(1 + x^2) = x$ is

A : y=x

B : x=0

C : x=1

D : y=0

Q.no 11. Rectilinear motion is a motion of body along a

A : Straight line

B : Circular path

C : Parabolic path

D : Hyperbolic path

Q.no 12. The general solution of Linear Differential equation $\frac{dx}{dy} + Px = Q$ where P and Q are functions of y or constants, is

A : $x\,e^{\int p dx} = \int Q\,e^{\int p dx} dx + c$

B : $x\,e^{\int p dy} = \int Q\,e^{\int p dy} dy + c$

C : $y\,e^{\int p dx} = \int Q\,e^{\int p dx} dx + c$

D : $y\,e^{\int p dx} = \int Q\,e^{\int p dx} dy + c$

Q.no 13. The solution of the DE $\frac{dy}{dx} = \frac{x^2}{y^3}$ is

A : $y^3 - x^3 = c$

B : $3y^4 - 4x^3 = c$

C : $y^2 - x^3 = c$

D : $x^2 - y^2 = c$

Q.no 14. Half range Fourier cosine series for $f(x)$ defined in the interval $0 \le x \le L$ is

A : Half range Fourier cosine series for $f(x)$ defined in the interval $0 \le x \le L$ is

B : $\frac{a_0}{2}+\sum_{n=1}^{\infty} a_n \cos\frac{nx}{L}$

C : $\frac{a_0}{2}+\sum_{n=1}^{\infty} a_n \cos\frac{n\pi x}{L}$

D : $\frac{a_0}{2}+\sum_{n=1}^{\infty}\left(a_n\, cos\frac{n\pi x}{L}+b_n \sin\frac{n\pi x}{L}\right)$

Q.no 15. Gamma function of n > 0 is defined as

A : $\int_0^{\infty} e^x x^{n-1}\,dx$

B : $\int_0^{\infty} e^x x^{n-1}\,dx$

C : $\int_0^{\infty} e^{-x} x^{n-1}\,dx$

D : $\int_0^{\infty} e^{-x} x^{1-n}\,dx$

Q.no 16. The value of $erf\,(3)+erf_c\,(3)$ is

A : 3

B : 2

C : 1

D : 0

Q.no 17. If $I(\alpha)=\int_a^b f(x,\alpha)\,dx$ where α is parameter and $a,\ b$ are constants then by DUIS rule $\frac{dI(\alpha)}{d\alpha}$ is

A : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx$

B : $\int_a^b \frac{\partial}{\partial x} f(x,\alpha)dx$

C : $f(b,\alpha) - f(a,\alpha)$

D : $f(x,\alpha)$

Q.no 18. For RC circuit the charge q satisfies the linear D.E.

A : $R + \frac{dq}{dt} = E$

B : $Ri + q = 0$

C : $A = \frac{1}{3}\pi r^2 l$

D : $R\frac{dq}{dt} + \frac{q}{C} = E$

Q.no 19. The integrating factor of $(x^2 + y^2 + x)dx + xydy = 0$ using non exact rule $\frac{\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)}{N}$ is

A : x

B : 1/x

C : x2

D : xy

Q.no 20. To change Cartesian coordinates (x, y, z) to spherical polar coordinate (r, θ, ϕ);$dxdydz$ is replaced by

A : To change Cartesian coordinates (x, y, z) to spherical polar coordinate (r, θ, ϕ);$dxdydz$ is replaced by

B : $r^2 \cos\theta dr d\theta d\phi$

C : $r^2 dr d\theta d\phi$

D : $rdrd\theta d\phi$

Q.no 21. Voltage drop across inductance L is given by

A : Li

B : L di/dt

C : dL/dt

D : L dL/dt

Q.no 22. $erf(x) - erfc(x) = 1 \quad erfc\,(x) = ?$

A : $\frac{2}{\sqrt{\pi}} \int_0^x e^{-u^2} du$

B : $\frac{2}{\sqrt{\pi}} \int_x^\infty e^{-u^2} du$

C : $\frac{2}{\sqrt{\pi}} \int_0^{x^2} e^{-t} t^{-1/2} dt$

D : 0

Q.no 23. Reduction formula for gamma function is

A : $\Gamma(n+1) = (n-1)\Gamma(n-1)$

B : $\Gamma(n+1) = n\Gamma(n)$

C : $\Gamma(n+1) = (n-1)\Gamma(n)$

D : $\Gamma(n+1) = n \quad \Gamma(n-1)$

Q.no 24.

Find semi-vertical angle for a right circular cone with vertex at the point (1,0,1)which passes through the point (1,1,1) and axis of cone has direction ratios 1,1,1

A : $\sin\alpha = \frac{a_1 a_2 + b_1 b_2 + c_1 c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\,\sqrt{a_2^2 + b_2^2 + c_2^2}}$

B : $\cos\alpha = \dfrac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\,\sqrt{a_2^2 + b_2^2 + c_2^2}}$

C : $\cos\alpha = a_1a_2 + b_1b_2 + c_1c_2$

D : $\sin\alpha = a_1a_2 + b_1b_2 + c_1c_2$

Q.no 25. The value of equivalent form of gamma function $\int_0^\infty e^{-kx}x^{n-1}\,dx$ is

A : $\dfrac{\Gamma n}{n^k}$

B : $\dfrac{\Gamma n}{k^n}$

C : $\dfrac{\Gamma n}{k!}$

D : $\Gamma(n+k+1)$

Q.no 26. The value of the integral $\int_0^b e^{-u^2}\,du$ is

A : $\dfrac{2}{\sqrt{\pi}}\int_0^x e^{-u^2}\,du$

B : $\dfrac{\sqrt{\pi}}{2}\,erf\,(b)$

C : $\dfrac{2}{\sqrt{\pi}}\,erf_c\,(b)$

D : $erf\,(b)$

Q.no 27. The formula to find the length of the curve $r = f(\theta)$ from $\theta = \theta_1$ to $\theta = \theta_2$ is

A : $\int_{\theta_1}^{\theta_2} \sqrt{1+\left(\frac{dr}{d\theta}\right)^2}\, d\theta$

B : $\int_{\theta_1}^{\theta_2} \sqrt{r^2+\left(\frac{dr}{d\theta}\right)^2}\, d\theta$

C : $\int_{\theta_1}^{\theta_2} \sqrt{r^2+\left(\frac{dr}{d\theta}\right)^2}\, dr$

D : $\int_{\theta_2}^{\theta_1} \sqrt{r^2+\left(\frac{dr}{d\theta}\right)^2}\, d\theta$

Q.no 28. If $I_n=\int_0^{\pi/2} sin^n x\, dx$, where n is positive even integer then I_n is calculated from

A : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}\dots\dots\frac{3}{4}.\frac{1}{2}$

B : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}\dots\dots\frac{3}{4}.\frac{1}{2}.\pi$

C : $\left(\frac{n+1}{n}.\frac{n.+3}{n+2.}.\frac{n+5}{n+4}\right)\dots\dots\frac{\pi}{2}$

D : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}\dots\dots\frac{3}{4}.\frac{1}{2}.\frac{\pi}{2}$

Q.no 29. The value of λ for which the differential equation $(xy^2+\lambda x^2y)dx+(x+y)x^2dy=0$ is exact

A : 2

B : -3

C : 3

D : -2

Q.no 30. If the sphere $x^2 + y^2 + z^2 = 25$,

$$x^2 + y^2 + z^2 - 18x - 24y - 40z + 225 = 0$$

touches each other externally then distance between their centers is:

A : 20

B : 5

C : 15

D : 25

Q.no 31. Which of the following is true?

A : $erf(x) - erfc(x) = 1$

B : $erf(x) + erfc(x) = 1$

C : $erf(x) + erfc(x) = 2$

D : $erf(-x) = erf(x)$

Q.no 32. The integrating factor for the DE $(1 + x^2)\frac{dy}{dx} + xy = 0$ is

A : e^{1+x^2}

B : $\log(x^2 + 1)$

C : $\sqrt{x^2 + 1}$

D : $1 + x^2$

Q.no 33. A particle moving in straight line with acceleration $k(x + \frac{a^4}{x^3})$ directed towards origin. The equation of motion is

A : $\frac{dv}{dx} = -k(x + \frac{a^4}{x^3})$

B : $v\frac{dv}{dx} = k(x + \frac{a^4}{x^3})$

C : $v\frac{dv}{dx} = -k(x + \frac{a^4}{x^3})$

D : $\frac{dv}{dx} = (x + \frac{a^4}{x^3})$

Q.no 34.

The equation of asymptotes parallel to y-axis to the curve represented by the equation

$y^2(4-x) = x(x-2)^2$ is

A : x=2

B : y=0

C : x=4

D : x=0

Q.no 35. The differential equation for the current in an electric circuit containing resistance R and inductance L in series with voltage source E sin(wt) is

A : $L\frac{di}{dt} + \frac{q}{C} = E$

B : $Li + R\frac{di}{dt} = Esin\omega t$

C : $L\frac{di}{dt} + Ri = 0$

D : $L\frac{di}{dt} + Ri = 0$

Q.no 36. The curve $xy^2 = a^2(a-x)$

A : passes through the point (-a,0)

B : does not pass through origin

C : passes through the origin

D : passes through the point (a,a)

Q.no 37.

Fourier series representation of periodic function $f(x)$ with period 2π which satisfies the Dirichlet's conditions is

A : $\frac{a_0}{2}+\sum_{n=1}^{\infty}(a_n \cos nx + b_n \sin nx)$

B : $\frac{a_0}{2}+\sum_{n=1}^{\infty}(a_n \cos n\pi x + b_n \sin n\pi x)$

C : $\frac{a_0}{2}+\sum_{n=1}^{\infty}(a_n \cos nx)(b_n \sin nx)$

D : $\frac{a_0}{2}+(a_n \cos nx + b_n \sin nx)$

Q.no 38. The center and radius of the sphere $3(x^2+ y^2 + z^2)-30x+12y-18z+89=0$ is

A : (10,-4,6) , $\frac{5}{\sqrt{3}}$

B : (15,-6,9) , $\frac{\sqrt{203}}{\sqrt{3}}$

C : (5,-2,3) , $\frac{5}{\sqrt{3}}$

D : (-5,2,-3) , $\frac{5}{3}$

Q.no 39. If n is a positive integer, then $\Gamma(n+1)$ is

A : (n+1)!

B : (n+2)!

C : (n-1)!

D : n!

Q.no 40. The formula to find the length of the curve $y = f(x)$ from $x = a$ to $x = b$ is $s =$

A : $\int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dx$

B : $\int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dy$

C : $\int_a^b \sqrt{a^2 + \left(\frac{dy}{dx}\right)^2}\, dx$

D : $\int_a^b \sqrt{a^2 + b^2\left(\frac{dy}{dx}\right)^2}\, dy$

Q.no 41. The differential equation for the current i in an electric circuit containing resistance 100 ohm and an inductance of 0.5 henery connected in series with battery of 20 volts is

A : $0.5\frac{di}{dt} + 100i = 0$

B : $0.5\frac{di}{dt} + 100i = 20$

C : $100\frac{di}{dt} + 0.5i = 0$

D : $100\frac{di}{dt} + 0.5R = 0$

Q.no 42. The integrating factor of the DE $\frac{dx}{dy} + \frac{3}{y}x = \frac{1}{y^2}$

A : $-y^3$

B : y^3

C : x^2y

D : x^3

Q.no 43.

Axis of the right circular cylinder is $\frac{x-1}{2}=\frac{y+3}{-1}=\frac{z-2}{5}$ what are direction cosines of axis

A : $\alpha=\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

B : $\left(\frac{2}{\sqrt{30}},\frac{-1}{\sqrt{30}},\frac{5}{\sqrt{30}}\right)$

C : $\left(\frac{-2}{\sqrt{30}},\frac{1}{\sqrt{30}},\frac{-5}{\sqrt{30}}\right)$

D : $\left(\frac{2}{\sqrt{30}},\frac{1}{\sqrt{30}},\frac{5}{\sqrt{30}}\right)$

Q.no 44.

The equation of sphere which passes through the point (4, 6, 3) and passes through the circle $(x-1)^2+(y-2)^2=25$, $z=0$ is

A : $x^2+y^2+z^2-2x-4y-3z-20=0$

B : $x^2+y^2+z^2+3x-4y+3z-16=0$

C : $2x^2+2y^2+2z^2+6x-3y+2z=0$

D : $x^2+y^2+z^2+4x-4y+3z-20=0$

Q.no 45. The value of $erf(0)+erf(\infty)$ is

A : 1

B : -1

C : 0

D : ∞

Q.no 46. If $I(\alpha)=\int_0^1\frac{x^{\alpha}-1}{\log x}dx$, $\alpha\geq 0$ then by DUIS $\frac{dI}{d\alpha}$ is

A : $\int_0^1 \log x \, dx$

B : $\int_0^1 x^{\alpha} \log x \, dx$

C : $\int_0^1 x^{\alpha} dx$

D : $\int_0^1 x^{-\alpha} dx$

Q.no 47. In a circuit containing resistance R and inductance L in series with constant voltage source E current i is given by $i = \frac{E}{R}\left(1 - e^{-\frac{R}{L}t}\right)$, then maximum current $i_{\max}$ is

A : E/R

B : R/E

C : ER

D : 0

Q.no 48. A capacitor C=0.01 farad in series with resistor R=20 ohms is charged from battery E=10 volts. If initially capacitor is completely discharged then differential equation for charge q(t) is given by

A : $20\frac{dq}{dt} + \frac{q}{0.01} = 0 \ ; \ q(0) = 0$

B : $20\frac{dq}{dt} + 0.01q = 10 \ ; \ q(0) = 0$

C : $20\frac{dq}{dt} + \frac{q}{0.01} = 10 \ ; \ q(0) = 0$

D : $20\frac{dq}{dt} + 0.01q = 0 \ ; \ q(0) = 0$

Q.no 49. Radius of right circular cylinder is 2 and direction ratios 2,-1,5 and fixed point on axis of the line (1,-3,2)then the equation of right circular cylinder is

A : $(x+1)^2 + (y+3)^2 + (z-2)^2 = 2^2 + \left(\frac{2x-y+5z-15}{\sqrt{30}}\right)^2$

B : $(x+1)^2 + (y+3)^2 + (z-2)^2 = 2^2 + \left(\frac{2x-y+5z-15}{\sqrt{30}}\right)^2$

C : $(x-1)^2 + (y+3)^2 - (z-2)^2 = 2^2 + \left(\frac{2x-y-5z-15}{\sqrt{30}}\right)^2$

D : $(x-1)^2 + (y+3)^2 + (z-2)^2 = 2^2 + \left(\frac{2x-y+5z-15}{\sqrt{30}}\right)^2$

Q.no 50. B(4,5)=

A : 1/280

B : 4/105

C : 1/70

D : 1/210

Q.no 51. If $I(\alpha)=\int_a^b f(x,\alpha)dx$ where a, b are function of parameter α then by DUIS rule $\frac{dI(\alpha)}{d\alpha}$ is

A : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx + f(a,\alpha)\frac{da}{d\alpha} - f(b,\alpha)\frac{db}{d\alpha}$

B : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx + f(b,\alpha)\frac{db}{d\alpha} - f(a,\alpha)\frac{da}{d\alpha}$

C : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx + f(b,\alpha)\frac{db}{d\alpha} - f(a,\alpha)\frac{da}{d\alpha}$

D : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx$

Q.no 52. Radius of right circular cylinder is 5and whose axis is the line $\frac{x-2}{3} = \frac{y-3}{1} = \frac{z+1}{1}$ Then the equation of right circular cylinder is

A : $(x+2)^2 + (y+3)^2 + (z+1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

B : $(x-2)^2 + (y-3)^2 + (z-1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

C : $(x+2)^2 + (y-3)^2 + (z+1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

D : $(x-2)^2 + (y-3)^2 + (z+1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

Q.no 53. The solution of the DE $\frac{dy}{dx} + y = e^{-x}$ is

A : $ye^{-x} + c = x$

B : $ye^{x} + x = c$

C : $ye^{x} = x + c$

D : $y = x + c$

Q.no 54. The value of integration $\int_0^1 \int_x^{\sqrt{x}} xydxdy$ is equal to

A : 0

B : -1/24

C : 1/24

D : 24

Q.no 55.

Find the equation of right circular cone whose vertex is at origin, whose axis is the line $\frac{x}{2} = \frac{y}{-1} = \frac{z}{2}$ and semi-vertical angle $\frac{\pi}{4}$

A : $3(x^2 + y^2 + z^2) = 4\,(2x - y + 2z)^2$

B : $9(x^2+y^2+z^2)=2\,(2x-y+2z)^2$

C : $6(x^2+y^2+z^2)=2\,(2x-y+2z)^2$

D : $(x^2+y^2+z^2)=\,(2x-y+2z)^2$

Q.no 56. $B\left(\frac{1}{4},\frac{3}{4}\right)$ is equal to

A : $\frac{2\pi}{\sqrt{3}}$

B : $\frac{2\pi}{\sqrt{3}}$

C : 0

D : $\pi\sqrt{2}$

Q.no 57.

The two spheres $x^2+\ y^2+\ z^2-\ 12x-18y-24z+29=0$ and $x^2+\ y^2+\ z^2+\ 3x-3y+3z-56=0$

A : touches each other internally

B : touches each other externally

C : touches each other Orthogonally

D : Intersecting each other

Q.no 58. The value of integration $\int_0^1\int_{x^2}^{x} xy(x+y)dxdy$ is equal to

A : 3/15

B : 2/15

C : 4/15

D : 1/15

Q.no 59. Fourier coefficient a_0 in the Fourier series expansion of

$f(x) = x\sin x\,;\, 0 \le x \le 2\pi$ and $f(x+2\pi) = f(x)$

A : 2

B : 0

C : -2

D : -4

Q.no 60. The value of integration $\int_0^2 \int_0^{x^2} e^{\frac{y}{x}} dx dy$ is equal to

A : $e^2 - 2$

B : $2e^2 - 1$

C : $e^2 - 1$

D : $e^2 + 1$

Answer for Question No 1. is d

Answer for Question No 2. is b

Answer for Question No 3. is d

Answer for Question No 4. is b

Answer for Question No 5. is d

Answer for Question No 6. is c

Answer for Question No 7. is a

Answer for Question No 8. is c

Answer for Question No 9. is a

Answer for Question No 10. is a

Answer for Question No 11. is a

Answer for Question No 12. is b

Answer for Question No 13. is b

Answer for Question No 14. is c

Answer for Question No 15. is c

Answer for Question No 16. is c

Answer for Question No 17. is a

Answer for Question No 18. is d

Answer for Question No 19. is a

Answer for Question No 20. is a

Answer for Question No 21. is b

Answer for Question No 22. is b

Answer for Question No 23. is b

Answer for Question No 24. is b

Answer for Question No 25. is b

Answer for Question No 26. is b

Answer for Question No 27. is b

Answer for Question No 28. is d

Answer for Question No 29. is c

Answer for Question No 30. is d

Answer for Question No 31. is b

Answer for Question No 32. is b

Answer for Question No 33. is c

Answer for Question No 34. is c

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Answer for Question No 38. is c

Answer for Question No 39. is d

Answer for Question No 40. is a

Answer for Question No 41. is b

Answer for Question No 42. is b

Answer for Question No 43. is b

Answer for Question No 44. is a

Answer for Question No 45. is a

Answer for Question No 46. is c

Answer for Question No 47. is a

Answer for Question No 48. is c

Answer for Question No 49. is d

Answer for Question No 50. is a

Answer for Question No 51. is c

Answer for Question No 52. is d

Answer for Question No 53. is c

Answer for Question No 54. is c

Answer for Question No 55. is b

Answer for Question No 56. is d

Answer for Question No 57. is c

Answer for Question No 58. is b

Answer for Question No 59. is c

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Q.no 1. The curve $xy^2 = a^2(a-x)$

A : passes through the point (-a,0)

B : does not pass through origin

C : passes through the origin

D : passes through the point (a,a)

Q.no 2.
Find semi-vertical angle for a right circular cone with vertex at the point $(1,0,1)$ which passes through the point $(1,1,1)$ and axis of cone has direction ratios $1,1,1$

A : $\sin\alpha = \dfrac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2+b_1^2+c_1^2}\,\sqrt{a_2^2+b_2^2+c_2^2}}$

B : $\cos\alpha = \dfrac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2+b_1^2+c_1^2}\,\sqrt{a_2^2+b_2^2+c_2^2}}$

C : $\cos\alpha = a_1a_2 + b_1b_2 + c_1c_2$

D : $\sin\alpha = a_1a_2 + b_1b_2 + c_1c_2$

Q.no 3. Fourier law of heat conduction states that, the quantity of heat flow across an area A cm2 is

A : proportional to product of area A and temperature gradient dT/dx

B : inversely proportional to product of area A and temperature gradient dT/dx

C : equal to sum of area A and temperature gradient

D : equal to difference of area A and temperature gradient dT/dx

Q.no 4. If the sphere $x^2 + y^2 + z^2 = 25$,

$x^2 + y^2 + z^2 - 18x - 24y - 40z + 225 = 0$

touches each other externally then distance between their centers is:

A : 20

B : 5

C : 15

D : 25

Q.no 5. The solution of the DE $\frac{dy}{dx} = \frac{x^2}{y^3}$ is

A : $y^3 - x^3 = c$

B : $3y^4 - 4x^3 = c$

C : $y^2 - x^3 = c$

D : $x^2 - y^2 = c$

Q.no 6. If the differential equation $M(x, y)dx + N(x, y)dy = 0$ is not exact

and it can be written as $yf_1(x, y)dx + xf_2(x, y)dy = 0$ then integrating factor is

A : $\frac{1}{My+Nx}; My+Nx \neq 0$

B : $\frac{1}{Mx+Ny}\ ; Mx+Ny \neq 0$

C : $\frac{1}{Mx-Ny}\ ; Mx-Ny \neq 0$

D : $\frac{1}{My-Nx}; My-Nx \neq 0$

Q.no 7. The general solution of Linear Differential equation $\frac{dx}{dy}+Px=Q$ where P and Q are functions of y or constants, is

A : $x\,e^{\int p dx} = \int Q\, e^{\int p dx} dx + c$

B : $x\,e^{\int p dy} = \int Q\, e^{\int p dy} dy + c$

C : $y\,e^{\int p dx} = \int Q\, e^{\int p dx} dx + c$

D : $y\,e^{\int p dx} = \int Q\, e^{\int p dx} dy + c$

Q.no 8. Gamma function of n > 0 is defined as

A : $\int_0^\infty e^x x^{n-1}\, dx$

B : $\int_0^\infty e^x x^{n-1}\, dx$

C : $\int_0^\infty e^{-x} x^{n-1}\, dx$

D : $\int_0^\infty e^{-x} x^{1-n}\, dx$

Q.no 9. The value of the integral $\int_0^b e^{-u^2}\,du$ is

A : $\frac{2}{\sqrt{\pi}}\int_0^x e^{-u^2}\,du$

B : $\frac{\sqrt{\pi}}{2} erf\,(b)$

C : $\frac{2}{\sqrt{\pi}} erf_c\,(b)$

D : $erf\,(b)$

Q.no 10. A circuit containing inductance L capacitance C in series without applied electromotive force. By Kirchhoff's voltage law differential equation for current i is

A : $L\frac{di}{dt}+\frac{q}{c}=0$

B : $L\frac{di}{dt}+Ri=0$

C : $L\frac{di}{dt}+Ri=E$

D : $L\frac{di}{dt}+\frac{q}{c}=E$

Q.no 11. In a D.E. $L\frac{di}{dt}+Ri=E$, E means

A : Voltage

B : Current

C : Resistance

D : Electromotive force

Q.no 12. $\int_0^{\pi/2} sin^p\theta\, cos^q\theta\, d\theta$ is equal to

A : $B\left(\frac{p-1}{2},\frac{q-1}{2}\right)$

B : $\frac{1}{2}B\left(\frac{p+1}{2},\frac{q+1}{2}\right)$

C : $B\left(\frac{p+1}{2},\frac{q+1}{2}\right)$

D : $B(p,q)$

Q.no 13. If $I_n=\int_0^{\pi/2} sin^n x\, dx$, where n is positive even integer then I_n is calculated from

A : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}\dots\dots\frac{3}{4}.\frac{1}{2}$

B : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}\dots\dots\frac{3}{4}.\frac{1}{2}.\pi$

C : $\left(\frac{n+1}{n}.\frac{n.+3}{n+2.}.\frac{n+5}{n+4}\right)\dots\dots\frac{\pi}{2}$

D : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}\dots\dots\frac{3}{4}.\frac{1}{2}.\frac{\pi}{2}$

Q.no 14. The integrating factor for the DE $(1+x^2)\frac{dy}{dx}+xy=0$ is

A : e^{1+x^2}

B : $\log(x^2+1)$

C : $\sqrt{x^2+1}$

D : $1+x^2$

Q.no 15. The integrating factor for the DE $\frac{dy}{dx}+\frac{x}{1+x}y=1+x$ is

A : $e^{x(1+x)}$

B : $e^{x(1+x)}$

C : $e^{x/(1+x)}$

D : $1 + x^2$

Q.no 16. The differential equation for the current i in an electric circuit containing resistance 100 ohm and an inductance of 0.5 henery connected in series with battery of 20 volts is

A : $0.5\frac{di}{dt} + 100i = 0$

B : $0.5\frac{di}{dt} + 100i = 20$

C : $100\frac{di}{dt} + 0.5i = 0$

D : $100\frac{di}{dt} + 0.5R = 0$

Q.no 17. The integrating factor of $(x^2 + y^2 + x)dx + xydy = 0$ using non exact rule $\frac{\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)}{N}$ is

A : x

B : 1/x

C : x2

D : xy

Q.no 18. A pipe contains steam and is protected with a covering then in the formula $q = kA\,\frac{dT}{dt}$

A : $A = 2\pi rl$

B : $A = \frac{1}{3}\pi r^2 l$

C : $A = \frac{1}{3}\pi r^2 l$

D : $A = rl$

Q.no 19. The integrating factor of the DE $\frac{dy}{dx} + ycosx = \frac{sin2x}{2}$ is

A : e^{cosx}

B : e^{sinx}

C : sin x

D : cos x

Q.no 20. Reduction formula for gamma function is

A : $\Gamma(n+1) = (n-1)\Gamma(n-1)$

B : $\Gamma(n+1) = n\Gamma(n)$

C : $\Gamma(n+1) = (n-1)\Gamma(n)$

D : $\Gamma(n+1) = n \quad \Gamma(n-1)$

Q.no 21. The integrating factor of the DE $\frac{dx}{dy} + \frac{3}{y}x = \frac{1}{y^2}$

A : $-y^3$

B : y^3

C : x^2y

D : x^3

Q.no 22. According to D'Alembert's principle algebraic sum of forces acting on a body along a given direction is equal to

A : Velocity x Acceleration

B : Mass x Velocity

C : Mass x displacement

D : Mass x Acceleration

Q.no 23. $erf(x) - erfc(x) = 1 \quad erfc\,(x) = ?$

A : $\frac{2}{\sqrt{\pi}} \int_0^x e^{-u^2}\, du$

B : $\frac{2}{\sqrt{\pi}} \int_x^\infty e^{-u^2}\, du$

C : $\frac{2}{\sqrt{\pi}} \int_0^{x^2} e^{-t} t^{-1/2} dt$

D : 0

Q.no 24. If the equation of curve remains unchanged by replacing y by -y, then the curve is symmetric about

A : y-axis

B : line y=x

C : x-axis

D : line y=-x

Q.no 25. Moment of inertia of the lamina A about the y axis is equal to

A : $\int \int_A \rho x^2 dxdy$

B : $\int \int_A \rho y^2 dxdy$

C : $\int \int_A \rho(x^2 + y^2) dxdy$

D : $\int \int_A \rho x^2 y^2 dxdy$

Q.no 26. The integrating factor of $\frac{dy}{dx} + Py = Q$ is

A : $e^{\int pdx}$

B : $e^{\int p dy}$

C : $e^{\int Q dx}$

D : $e^{\int Q dy}$

Q.no 27. If $\phi(a) = \int_0^{\infty} e^{-bx^2} \cos(2ax)\, dx,\ b > 0$ then by DUIS rule $\frac{d\phi}{da}$ is

A : $\int_0^{\infty} \frac{\partial}{\partial b}\left[e^{-bx^2} \cos(2ax)\right] dx$

B : $e^{-bx^2} \cos(2ax)$

C : $\int_0^{\infty} \frac{\partial}{\partial x}\left[e^{-bx^2} \cos(2ax)\right] dx$

D : $\int_0^{\infty} \frac{\partial}{\partial a}\left[e^{-bx^2} \cos(2ax)\right] dx$

Q.no 28. If double integral in Cartesian coordinate is given by $\int\int_R f(x,y)\, dxdy$ then the value of same integral in polar form is

A : $\int\int_R f(r\cos\theta, r\sin\theta)\, rdrd\theta$

B : $\int\int_R f(r\cos\theta, r\sin\theta)\, rdrd\theta$

C : $\int\int_R f(r\cos\theta, r\sin\theta)\, r^2drd\theta$

D : $\int\int_R f(r\sin\theta, r\cos\theta)\, rdrd\theta$

Q.no 29.

Fourier series representation of periodic function $f(x)$ with period 2π which satisfies the Dirichlet's conditions is

A : $\frac{a_0}{2}+\sum_{n=1}^{\infty}(a_n \cos nx + b_n \sin nx)$

B : $\frac{a_0}{2}+\sum_{n=1}^{\infty}(a_n \cos n\pi x + b_n \sin n\pi x)$

C : $\frac{a_0}{2}+\sum_{n=1}^{\infty}(a_n \cos nx)(b_n \sin nx)$

D : $\frac{a_0}{2}+(a_n \cos nx + b_n \sin nx)$

Q.no 30. B(m,n) is equal to

A : $\int_0^1 x^{m-1}(1-x)^{n-1}dx$

B : $\int_0^{\infty} x^{m-1}(1-x)^{n-1}dx$

C : $\int_0^1 x^{m}(1-x)^{n}dx$

D : $\int_0^1 e^{-x}x^{n-1}dx$

Q.no 31. The integrating factor of $(y^4+2y)dx+(xy^3+2y^4-4x)dy=0$ using non exact rule $\frac{\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)}{M}$ is

A : $\frac{1}{y^3}$

B : 1/x

C : y^3

D : $\frac{1}{x^3}$

Q.no 32. Moment of inertia of the lamina A about the x axis is equal to

A : $\int\int_A \rho x^2 dxdy$

B : $\int\int_A \rho y^2 dxdy$

C : $\int\int_A \rho(x^2+y^2)dxdy$

D : $\int\int_A \rho x^2 y^2 dxdy$

Q.no 33.

Equation of right circular cylinder whose radius is 'r' and axis is the line $\frac{x}{l} = \frac{y}{m} = \frac{z}{n}$ is

A : $x^2+y^2+z^2 = r^2 + \left(\frac{lx+my+nz}{\sqrt{l^2+m^2+n^2}}\right)^2$

B : $\alpha = \cos^{-1} 1$

C : $x^2+y^2+z^2 = r^2 + \frac{lx+my+nz}{\sqrt{l^2+m^2+n^2}}$

D : $(x+y+z) = r^2 + \left(\frac{lx+my+nz}{\sqrt{l^2+m^2+n^2}}\right)^2$

Q.no 34. The integrating factor of the DE $cosx\frac{dy}{dx} + ysinx = 1$ is

A : sec x

B : cot x

C : tan x

D : sin x

Q.no 35. The formula to find the length of the curve $r = f(\theta)$ from $\theta = \theta_1$ to $\theta = \theta_2$ is

A : $\int_{\theta_1}^{\theta_2} \sqrt{1+\left(\frac{dr}{d\theta}\right)^2}\, d\theta$

B : $\int_{\theta_1}^{\theta_2} \sqrt{r^2+\left(\frac{dr}{d\theta}\right)^2}\, d\theta$

C : $\int_{\theta_1}^{\theta_2} \sqrt{r^2+\left(\frac{dr}{d\theta}\right)^2}\, dr$

D : $\int_{\theta_2}^{\theta_1} \sqrt{r^2+\left(\frac{dr}{d\theta}\right)^2}\, d\theta$

Q.no 36. Error function of x, $erf\left(x\right)$ is defined as

A : $\frac{2}{\sqrt{\pi}}\int_{0}^{x} e^{-u^2} du$

B : $\frac{2}{\sqrt{\pi}}\int_{x}^{\infty} e^{-u^2} du$

C : $\int_{0}^{\infty} e^{-x} x^{n-1} dx$

D : $\frac{2}{\sqrt{\pi}}\int_{0}^{\infty} e^{-u^2} du$

Q.no 37. For RC circuit the charge q satisfies the linear D.E.

A : $R+\frac{dq}{dt}=E$

B : $Ri+q=0$

C : $A=\frac{1}{3}\pi r^2 l$

D : $R\frac{dq}{dt}+\frac{q}{C}=E$

Q.no 38. If the DE $Mdx+Ndy=0$ can be written as $x^a y^b(mydx+nxdy)+x^r y^s(pydx+qxdy)=0$ then integrating factor is

A : $x^h y^k$

B : x^h

C : xy

D : $\frac{1}{x^h y^k}$

Q.no 39. Rectilinear motion is a motion of body along a

A : Straight line

B : Circular path

C : Parabolic path

D : Hyperbolic path

Q.no 40. Half range Fourier cosine series for $f(x)$ defined in the interval $0 \le x \le L$ is

A : Half range Fourier cosine series for $f(x)$ defined in the interval $0 \le x \le L$ is

B : $\frac{a_0}{2}+\sum_{n=1}^{\infty} a_n \cos\frac{nx}{L}$

C : $\frac{a_0}{2}+\sum_{n=1}^{\infty} a_n \cos\frac{n\pi x}{L}$

D : $\frac{a_0}{2}+\sum_{n=1}^{\infty} \left(a_n\, cos\frac{n\pi x}{L}+b_n \sin\frac{n\pi x}{L}\right)$

Q.no 41.

If $I(\alpha)=\int_{a}^{b} f(x,\alpha)dx$ where α is parameter and a, b are constants then by DUIS rule $\frac{dI(\alpha)}{d\alpha}$ is

A : $\int_{a}^{b} \frac{\partial}{\partial\alpha} f(x,\alpha)dx$

B : $\int_{a}^{b} \frac{\partial}{\partial x} f(x,\alpha)dx$

C : $f(b,\alpha)-f(a,\alpha)$

D : $f(x,\alpha)$

Q.no 42.

The equation of asymptotes parallel to y-axis to the curve represented by the equation $y^2(4-x)=x(x-2)^2$ is

A : x=2

B : y=0

C : x=4

D : x=0

Q.no 43.

If $I(\alpha)=\int_0^1 \frac{x^\alpha-1}{\log x}dx$, $\alpha\geq 0$ then by DUIS $\frac{dI}{d\alpha}$ is

A : $\int_0^1 \log x\, dx$

B : $\int_0^1 x^\alpha \log x\, dx$

C : $\int_0^1 x^\alpha dx$

D : $\int_0^1 x^{-\alpha}\,dx$

Q.no 44. In spherical co-ordinates volume is given by

A : $V = \int\int\int_V drd\theta d\phi$

B : $V = \int\int\int_V rdrd\theta d\phi$

C : $V = \int\int\int_V r^2\cos\theta drd\theta d\phi$

D : $V = \int\int\int_V r^2\sin\theta drd\theta d\phi$

Q.no 45. A capacitor C=0.01 farad in series with resistor R=20 ohms is charged from battery E=10 volts. If initially capacitor is completely discharged then differential equation for charge q(t) is given by

A : $20\frac{dq}{dt}+\frac{q}{0.01}=0\ ;\ q(0)=0$

B : $20\frac{dq}{dt}+0.01q=10\ ;\ q(0)=0$

C : $20\frac{dq}{dt}+\frac{q}{0.01}=10\ ;\ q(0)=0$

D : $20\frac{dq}{dt}+0.01q=0\ ;\ q(0)=0$

Q.no 46. Radius of right circular cylinder is 2 and direction ratios 2,-1,5 and fixed point on axis of the line (1,-3,2)then the equation of right circular cylinder is

A : $(x+1)^2+\ (y+3)^2+(z-2)^2=\ 2^2+\left(\frac{2x-y+5z-15}{\sqrt{30}}\right)^2$

B : $(x+1)^2+\ (y+3)^2+(z-2)^2=\ 2^2+\left(\frac{2x-y+5z-15}{\sqrt{30}}\right)^2$

C : $(x-1)^2 + (y+3)^2 - (z-2)^2 = 2^2 + \left(\frac{2x - y - 5z - 15}{\sqrt{30}}\right)^2$

D : $(x-1)^2 + (y+3)^2 + (z-2)^2 = 2^2 + \left(\frac{2x - y + 5z - 15}{\sqrt{30}}\right)^2$

Q.no 47.

The equation of sphere which passes through the point (4, 6, 3) and passes through the circle $(x-1)^2 + (y-2)^2 = 25,\ z = 0$ is

A : $x^2 + y^2 + z^2 - 2x - 4y - 3z - 20 = 0$

B : $x^2 + y^2 + z^2 + 3x - 4y + 3z - 16 = 0$

C : $2x^2 + 2y^2 + 2z^2 + 6x - 3y + 2z = 0$

D : $x^2 + y^2 + z^2 + 4x - 4y + 3z - 20 = 0$

Q.no 48. If $I(\alpha) = \int_0^1 \frac{x^\alpha - 1}{\log x} dx,\ \alpha \geq 0$ then by DUIS $\frac{dI}{d\alpha}$ is

A : $\log(\alpha + 1)$

B : $\log(\alpha - 1)$

C : $\log \alpha$

D : 0

Q.no 49. The solution of the DE $\frac{dy}{dx} + y = e^{-x}$ is

A : $ye^{-x} + c = x$

B : $ye^{x} + x = c$

C : $ye^{x} = x + c$

D : $y = x + c$

Q.no 50. B(4,5)=

A : 1/280

B : 4/105

C : 1/70

D : 1/210

Q.no 51. If $I(\alpha)=\int_a^b f(x,\alpha)dx$ where a, b are function of parameter α then by DUIS rule $\frac{dI(\alpha)}{d\alpha}$ is

A : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx + f(a,\alpha)\frac{da}{d\alpha} - f(b,\alpha)\frac{db}{d\alpha}$

B : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx + f(b,\alpha)\frac{db}{d\alpha} - f(a,\alpha)\frac{da}{d\alpha}$

C : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx + f(b,\alpha)\frac{db}{d\alpha} - f(a,\alpha)\frac{da}{d\alpha}$

D : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx$

Q.no 52. The value of integration $\int_0^1 \int_0^x (x^2 + y^2)\, dxdy$ is equal to

A : 4/3

B : 5/3

C : 2/3

D : 1

Q.no 53. Radius of right circular cylinder is 5and whose axis is the line $\frac{x-2}{3} = \frac{y-3}{1} = \frac{z+1}{1}$ Then the equation of right circular cylinder is

A : $(x+2)^2 + (y+3)^2 + (z+1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

B : $(x-2)^2+(y-3)^2+(z-1)^2=5^2+\left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

C : $(x+2)^2+(y-3)^2+(z+1)^2=5^2+\left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

D : $(x-2)^2+(y-3)^2+(z+1)^2=5^2+\left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

Q.no 54. The solution of exact DE $(x+2y-2)dx+(2x-y+3)dy=0$ is

A : $x^2+4xy-4x+6y=c$

B : $x^2+4xy-4x-y^2+6y=c$

C : $x^2+8xy+y^2=c$

D : $x^2+4xy-\frac{y^2}{2}+y=c$

Q.no 55. The value of $erf(0)+erf(\infty)$ is

A : 1

B : -1

C : 0

D : ∞

Q.no 56.

Area bounded by the parabola $y^2=4x$ and the line $y=x$ is calculated using

A : $\int_{y=0}^{4}\int_{x=y^2/4}^{y} dxdy$

B : $\int_{y=0}^{4}\int_{x=0}^{4} dxdy$

C : $\int_{y=0}^{4} \int_{x=0}^{y} dxdy$

D : $\int_{x=0}^{4} \int_{y=0}^{x} dxdy$

Q.no 57. In a circuit containing resistance R and inductance L in series with constant voltage source E current i is given by $i = \frac{E}{R}\left(1 - e^{-\frac{R}{L}t}\right)$, then maximum current $i_{\max}$ is

A : E/R

B : R/E

C : ER

D : 0

Q.no 58. $\int_0^{\pi/2} cos^6 x \, dx$ is equal to

A : $\frac{5}{16}$

B : $\frac{16}{5} . \frac{\pi}{2}$

C : $\frac{5}{16} . \frac{\pi}{2}$

D : $\frac{5}{48} . \frac{\pi}{2}$

Q.no 59. $\frac{5\pi}{128}$

A : $\frac{5\pi}{128}$

B : $\frac{3\pi}{128}$

C : $\frac{3\pi}{512}$

D : $\frac{5\pi}{64}$

Q.no 60.
If the plane $2x - 2y + z + 12 = 0$ touches the sphere $x^2 + y^2 + z^2 - 2x - 4y + 2z - 3 = 0$ then the point of contact is given by—

A : (1, 4, 3)

B : (-1, 4, -2)

C : (0, 1,2)

D : (1,2,-1)

Answer for Question No 1. is b

Answer for Question No 2. is b

Answer for Question No 3. is a

Answer for Question No 4. is d

Answer for Question No 5. is b

Answer for Question No 6. is c

Answer for Question No 7. is b

Answer for Question No 8. is c

Answer for Question No 9. is b

Answer for Question No 10. is a

Answer for Question No 11. is d

Answer for Question No 12. is b

Answer for Question No 13. is d

Answer for Question No 14. is b

Answer for Question No 15. is c

Answer for Question No 16. is b

Answer for Question No 17. is a

Answer for Question No 18. is a

Answer for Question No 19. is b

Answer for Question No 20. is b

Answer for Question No 21. is b

Answer for Question No 22. is d

Answer for Question No 23. is b

Answer for Question No 24. is c

Answer for Question No 25. is a

Answer for Question No 26. is a

Answer for Question No 27. is d

Answer for Question No 28. is a

Answer for Question No 29. is b

Answer for Question No 30. is a

Answer for Question No 31. is a

Answer for Question No 32. is b

Answer for Question No 33. is a

Answer for Question No 34. is a

Answer for Question No 35. is b

Answer for Question No 36. is a

Answer for Question No 37. is d

Answer for Question No 38. is a

Answer for Question No 39. is a

Answer for Question No 40. is c

Answer for Question No 41. is a

Answer for Question No 42. is c

Answer for Question No 43. is c

Answer for Question No 44. is d

Answer for Question No 45. is c

Answer for Question No 46. is d

Answer for Question No 47. is a

Answer for Question No 48. is a

Answer for Question No 49. is c

Answer for Question No 50. is a

Answer for Question No 51. is c

Answer for Question No 52. is c

Answer for Question No 53. is d

Answer for Question No 54. is b

Answer for Question No 55. is a

Answer for Question No 56. is a

Answer for Question No 57. is a

Answer for Question No 58. is c

Answer for Question No 59. is b

Answer for Question No 60. is b

Seat No -

Total number of questions : 60

1000505 T1 ENGINEERING MATHEMATICS II

Time : 1hr

Max Marks : 50

N.B

1) All questions are Multiple Choice Questions having single correct option.

2) Attempt any 50 questions out of 60.

3) Use of calculator is allowed.

4) Each question carries 1 Mark.

5) Specially abled students are allowed 20 minutes extra for examination.

6) Do not use pencils to darken answer.

7) Use only black/blue ball point pen to darken the appropriate circle.

8) No change will be allowed once the answer is marked on OMR Sheet.

9) Rough work shall not be done on OMR sheet or on question paper.

10) Darken ONLY ONE CIRCLE for each answer.

Q.no 1. The value of integration $\int_0^a \int_0^b \int_0^c x^2y^2z^2dxdydz$ is equal to

A : $\frac{abc}{3}$

B : $\frac{a^2b^2c^2}{3}$

C : $\frac{a^3b^3c^3}{27}$

D : $\frac{a^2b^2c^2}{9}$

Q.no 2. The integrating factor of the DE $cosx\frac{dy}{dx} + ysinx = 1$ is

A : sec x

B : cot x

C : tan x

D : sin x

Q.no 3. The value of equivalent form of gamma function $\int_0^{\infty} e^{-kx} x^{n-1}\, dx$ is

A : $\frac{\Gamma n}{n^k}$

B : $\frac{\Gamma n}{k^n}$

C : $\frac{\Gamma n}{k!}$

D : $\Gamma(n+k+1)$

Q.no 4. A circuit containing inductance L capacitance C in series with applied electromotive force E. By Kirchhoff's voltage law differential equation for current i is

A : $L\frac{di}{dt} + Ri = E$

B : $L\frac{di}{dt} + Ri = 0$

C : $L\frac{di}{dt} + \frac{q}{C} = E$

D : $L\frac{di}{dt} + \frac{q}{C} = 0$

Q.no 5. The formula to find the length of the curve $r = f(\theta)$ from $\theta = \theta_1$ to $\theta = \theta_2$ is

A : $\int_{\theta_1}^{\theta_2} \sqrt{1 + \left(\frac{dr}{d\theta}\right)^2}\, d\theta$

B : $\int_{\theta_1}^{\theta_2} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\ d\theta$

C : $\int_{\theta_1}^{\theta_2} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\ dr$

D : $\int_{\theta_2}^{\theta_1} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\ d\theta$

Q.no 6.

If $(\bar{x}, \bar{y})$ the coordinates of centroid of the plane area is given by

A : $\bar{x} = \frac{\int\int x\rho dxdy}{\int\int \rho dxdy}, \bar{y} = \frac{\int\int y\rho dxdy}{\int\int \rho dxdy}$

B : $\bar{x} = \frac{\int\int x^2\rho dxdy}{\int\int \rho dxdy}, \bar{y} = \frac{\int\int y^2\rho dxdy}{\int\int \rho dxdy}$

C : $\bar{x} = \frac{\int\int \rho dxdy}{\int\int x\rho dxdy}, \bar{y} = \frac{\int\int \rho dxdy}{\int\int y\rho dxdy}$

D : None of these

Q.no 7. The integrating factor of $(y^4 + 2y)dx + (xy^3 + 2y^4 - 4x)dy = 0$ using non exact rule $\frac{\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)}{M}$ is

A : $\frac{1}{y^3}$

B : 1/x

C : y^3

D : $\frac{1}{x^3}$

Q.no 8. The differential equation for the current in an electric circuit containing resistance R and inductance L in series with voltage source E sin(wt) is

A : $L\frac{di}{dt}+\frac{q}{C}=E$

B : $Li+R\frac{di}{dt}=Esin\omega t$

C : $L\frac{di}{dt}+Ri=0$

D : $L\frac{di}{dt}+Ri=0$

Q.no 9.

Find semi-vertical angle for a right circular cone with vertex at the point (1,0,1)which passes through the point (1,1,1) and axis of cone has direction ratios 1,1,1

A : $\sin\alpha=\frac{a_1a_2+b_1b_2+c_1c_2}{\sqrt{a_1^2+b_1^2+c_1^2}\sqrt{a_2^2+b_2^2+c_2^2}}$

B : $\cos\alpha=\frac{a_1a_2+b_1b_2+c_1c_2}{\sqrt{a_1^2+b_1^2+c_1^2}\sqrt{a_2^2+b_2^2+c_2^2}}$

C : $\cos\alpha=a_1a_2+b_1b_2+c_1c_2$

D : $\sin\alpha=a_1a_2+b_1b_2+c_1c_2$

Q.no 10.

The equation of asymptotes parallel to y-axis to the curve represented by the equation

$y^2(4-x)=x(x-2)^2$ is

A : x=2

B : y=0

C : x=4

D : x=0

Q.no 11. The integrating factor for the DE $(1+x^2)\frac{dy}{dx}+xy=0$ is

A : e^{1+x^2}

B : $\log(x^2+1)$

C : $\sqrt{x^2+1}$

D : $1+x^2$

Q.no 12. A particle moving in straight line with acceleration $k(x+\frac{a^4}{x^3})$ directed towards origin. The equation of motion is

A : $\frac{dv}{dx}=-k(x+\frac{a^4}{x^3})$

B : $v\frac{dv}{dx}=k(x+\frac{a^4}{x^3})$

C : $v\frac{dv}{dx}=-k(x+\frac{a^4}{x^3})$

D : $\frac{dv}{dx}=(x+\frac{a^4}{x^3})$

Q.no 13. The differential equation for the current i in an electric circuit containing resistance R=250 ohm and an inductance of L=640 henery in series with an electromotive force E=500 volts is

A : $640\frac{di}{dt}+250i=0$

B : $250\frac{di}{dt}+640i=500$

C : $640\frac{di}{dt}+250i=500$

D : $250\frac{di}{dt} + 640i = 0$

Q.no 14.

Condition for the two spheres $x^2 + y^2 + z^2 + 2u_1x + 2v_1y + 2w_1z + d_1 = 0$ and $x^2 + y^2 + z^2 + 2u_2x + 2v_2y + 2w_2z + d_2 = 0$ to be orthogonal is ---

A : $S + \lambda U = 0$

B : $S_1 - S_2 = 0$

C : $2u_1u_2 + 2v_1v_2 + 2w_1w_2 = d_1 + d_2$

D : $u_1u_2 + v_1v_2 + w_1w_2 = d_1 + d_2$

Q.no 15. If the equation of curve remains unchanged by replacing y by -y, then the curve is symmetric about

A : y-axis

B : line y=x

C : x-axis

D : line y=-x

Q.no 16.

If $I(\alpha) = \int_a^b f(x,\alpha)dx$ where α is parameter and a, b are constants then by DUIS rule $\frac{dI(\alpha)}{d\alpha}$ is

A : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx$

B : $\int_a^b \frac{\partial}{\partial x} f(x,\alpha)dx$

C : $f(b,\alpha) - f(a,\alpha)$

D : $f(x,\alpha)$

Q.no 17. The center and radius of the sphere $3(x^2 + y^2 + z^2) - 30x + 12y - 18z + 89 = 0$ is

A : $(10,-4,6)$, $\frac{5}{\sqrt{3}}$

B : $(15,-6,9)$, $\frac{\sqrt{203}}{\sqrt{3}}$

C : $(5,-2,3)$, $\frac{5}{\sqrt{3}}$

D : $(-5,2,-3)$, $\frac{5}{3}$

Q.no 18.

Find semi-vertical angle for a right circular cone with vertex at the point $(1,0,1)$ which passes through the point $(1,1,1)$ and axis of cone has direction ratios 1,1,1

A : $\alpha = \cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

B : $\alpha = \cos^{-1} 1$

C : $\alpha = \sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

D : $\alpha = \cos^{-1}(\sqrt{3})$

Q.no 19. The value of $\int\int\int_V dxdydz$ where V is the volume bounded by $x^2 + y^2 + z^2 = 1$

A : $\frac{4}{3}\pi$

B : 4π

C : π

D : $\frac{1}{3}\pi$

If the sphere $x^2 + y^2 + z^2 = 25$,

$x^2 + y^2 + z^2 - 18x - 24y - 40z + 225 = 0$

Q.no 20. touches each other externally then distance between their centers is:

A : 20

B : 5

C : 15

D : 25

Q.no 21. The integrating factor of the DE $\frac{dy}{dx} + ycosx = \frac{sin2x}{2}$ is

A : e^{cosx}

B : e^{sinx}

C : sin x

D : cos x

Q.no 22.

The equation of tangent to the curve at origin represented by the equation $y(1+x^2) = x$ is

A : y=x

B : x=0

C : x=1

D : y=0

Q.no 23. $\int_0^{\pi/2} sin^p\theta cos^q\theta \, d\theta$ is equal to

A : $B\left(\frac{p-1}{2}, \frac{q-1}{2}\right)$

B : $\frac{1}{2}B\left(\frac{p+1}{2}, \frac{q+1}{2}\right)$

C : $B\left(\frac{p+1}{2}, \frac{q+1}{2}\right)$

D : $B(p,q)$

Q.no 24. Fourier law of heat conduction states that, the quantity of heat flow across an area A cm2 is

A : proportional to product of area A and temperature gradient dT/dx

B : inversely proportional to product of area A and temperature gradient dT/dx

C : equal to sum of area A and temperature gradient

D : equal to difference of area A and temperature gradient dT/dx

Q.no 25. The integrating factor of the DE $\frac{dx}{dy} + \frac{3}{y}x = \frac{1}{y^2}$

A : $-y^3$

B : y^3

C : x^2y

D : x^3

Q.no 26. The integrating factor for the DE $\frac{dy}{dx} + \frac{x}{1+x}y = 1 + x$ is

A : $e^{x(1+x)}$

B : $e^{x(1+x)}$

C : $e^{x/(1+x)}$

D : $1 + x^2$

Q.no 27. For RC circuit the charge q satisfies the linear D.E.

A : $R + \frac{dq}{dt} = E$

B : $Ri + q = 0$

C : $A = \frac{1}{3}\pi r^2 l$

D : $R\frac{dq}{dt} + \frac{q}{C} = E$

Q.no 28. Reduction formula for gamma function is

A : $\Gamma(n+1) = (n-1)\Gamma(n-1)$

B : $\Gamma(n+1) = n\Gamma(n)$

C : $\Gamma(n+1) = (n-1)\Gamma(n)$

D : $\Gamma(n+1) = n \quad \Gamma(n-1)$

Q.no 29. $erf(x) - erfc(x) = 1 \quad erfc(x) = ?$

A : $\frac{2}{\sqrt{\pi}}\int_0^x e^{-u^2}\,du$

B : $\frac{2}{\sqrt{\pi}}\int_x^\infty e^{-u^2}\,du$

C : $\frac{2}{\sqrt{\pi}}\int_0^{x^2} e^{-t}t^{-1/2}\,dt$

D : 0

Q.no 30. If q be the quantity of heat that flows across an area A cm2 and thickness δx in one second where the difference of temperature at the faces is δT, then by Fourier's law of heat conduction

A : $q = -k\left(A - \frac{dt}{dx}\right)$, where k is thermal conductivity

B : $q = kA\frac{dT}{dx}$, where k is thermal conductivity

C : $q = -k\left(A + \frac{dt}{dx}\right)$, where k is thermal conductivity

D : $q = -kA\frac{dT}{dx}$, , where k is thermal conductivity

Q.no 31. The value of λ for which the differential equation $(xy^2 + \lambda x^2 y)dx + (x+y)x^2 dy = 0$ is exact

A : 2

B : -3

C : 3

D : -2

Q.no 32. Rectilinear motion is a motion of body along a

A : Straight line

B : Circular path

C : Parabolic path

D : Hyperbolic path

Q.no 33. To change Cartesian coordinates (x, y, z) to spherical polar coordinate (r, θ, ϕ);$dxdydz$ is replaced by

A : To change Cartesian coordinates (x, y, z) to spherical polar coordinate (r, θ, ϕ);$dxdydz$ is replaced by

B : $r^2 \cos\theta dr d\theta d\phi$

C : $r^2 dr d\theta d\phi$

D : $r dr d\theta d\phi$

Q.no 34. The integrating factor of $(3x^2y^4 + 2xy)dx + (2x^3y^3 - x^2)dy = 0$ using non exact rule $\frac{\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)}{M}$ is

A : y^2

B : $\frac{1}{y^2}$

C : y

D : 1/y

In a D.E. $L\frac{di}{dt} + Ri = E$, E means
Q.no 35.

A : Voltage

B : Current

C : Resistance

D : Electromotive force

Area enclosed by the polar curve $r = f_1(\theta)$ and $r = f_2(\theta)$ and the line $\theta = \alpha, \theta = \beta \alpha < \beta$ is given by
Q.no 36.

A : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} r dr d\theta$

B : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} dr d\theta$

C : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} r^2 \sin\theta dr d\theta$

D : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} r^2 \cos\theta dr d\theta$

A pipe contains steam and is protected with a covering then in the formula $q = kA\,\frac{dT}{dt}$
Q.no 37.

A : $A = 2\pi r l$

B : $A = \frac{1}{3}\pi r^2 l$

C : $A = \frac{1}{3}\pi r^2 l$

D : $A = rl$

Q.no 38. If $I_n=\int_0^{\pi/2} sin^n x\, dx$, where n is positive even integer then I_n is calculated from

A : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}\dots\dots\frac{3}{4}.\frac{1}{2}$

B : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}\dots\dots\frac{3}{4}.\frac{1}{2}.\pi$

C : $\left(\frac{n+1}{n}.\frac{n.+3}{n+2.}.\frac{n+5}{n+4}\right)\dots\dots\frac{\pi}{2}$

D : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}\dots\dots\frac{3}{4}.\frac{1}{2}.\frac{\pi}{2}$

Q.no 39.

Equation of right circular cylinder whose radius is ‘r’ and axis is the line $\frac{x}{l} = \frac{y}{m} = \frac{z}{n}$ is

A : $x^2+y^2+z^2 = r^2 + \left(\frac{lx+my+nz}{\sqrt{l^2+m^2+n^2}}\right)^2$

B : $\alpha = \cos^{-1} 1$

C : $x^2+y^2+z^2 = r^2 + \frac{lx+my+nz}{\sqrt{l^2+m^2+n^2}}$

D : $(x+y+z) = r^2 + \left(\frac{lx+my+nz}{\sqrt{l^2+m^2+n^2}}\right)^2$

Q.no 40. The amount of heat Q flowing through the area per unit time is

A : Q = thermal conductivity x Area x Rate of change of temp. across an area

B : Q = thermal conductivity x Area of slab

C : Q = thermal conductivity x Area x temp. gradient

D : Q = thermal conductivity x Area + Rate of flow of heat

Q.no 41. If double integral in Cartesian coordinate is given by $\int\int_R f(x,y)\,dxdy$ then the value of same integral in polar form is

A : $\int\int_R f(r\cos\theta, r\sin\theta)\, rdrd\theta$

B : $\int\int_R f(r\cos\theta, r\sin\theta)\, rdrd\theta$

C : $\int\int_R f(r\cos\theta, r\sin\theta)\, r^2drd\theta$

D : $\int\int_R f(r\sin\theta, r\cos\theta)\, rdrd\theta$

Q.no 42. Error function of x, $erf(x)$ is defined as

A : $\frac{2}{\sqrt{\pi}}\int_0^x e^{-u^2}du$

B : $\frac{2}{\sqrt{\pi}}\int_x^\infty e^{-u^2}du$

C : $\int_0^\infty e^{-x}x^{n-1}dx$

D : $\frac{2}{\sqrt{\pi}}\int_0^\infty e^{-u^2}du$

Q.no 43. B(4,5)=

A : 1/280

B : 4/105

C : 1/70

D : 1/210

Q.no 44.

If the plane $4x - 3y + 6z - 35 = 0$ is tangential to the sphere

$x^2 + y^2 + z^2 - y - 2z - 14 = 0$ then the length of perpendicular from any point P on the plane is---

A : $\frac{61}{2}$

B : $\frac{61}{2}$

C : 30

D : $-\frac{\sqrt{61}}{2}$

Q.no 45.

A particle of mass m moves in a horizontal straight line OA with acceleration $\frac{k}{x^3}$ at a distance x and directed towards origin O. Then the differential equation of motion is

A : $v\frac{dv}{dx} = \frac{k}{x^3}$

B : $v\frac{dv}{dx} = -\frac{k}{x^3}$

C : $\frac{dv}{dx} = -\frac{k}{x^3}$

D : $\frac{dv}{dx} = \frac{k}{x^3}$

Q.no 46.

Area bounded by the parabola $y^2 = 4x$ and the line $y = x$ is calculated using

A : $\int_{y=0}^{4} \int_{x=y^2/4}^{y} dxdy$

B : $\int_{y=0}^{4} \int_{x=0}^{4} dxdy$

C : $\int_{y=0}^{4} \int_{x=0}^{y} dxdy$

D : $\int_{x=0}^{4} \int_{y=0}^{x} dxdy$

Q.no 47. If $I(\alpha) = \int_0^1 \frac{x^\alpha - 1}{\log x} dx$, $\alpha \geq 0$ then by DUIS $\frac{dI}{d\alpha}$ is

A : $\log(\alpha + 1)$

B : $\log(\alpha - 1)$

C : $\log \alpha$

D : 0

Q.no 48. In spherical co-ordinates volume is given by

A : $V = \int \int \int_V drd\theta d\phi$

B : $V = \int \int \int_V rdrd\theta d\phi$

C : $V = \int \int \int_V r^2 \cos\theta drd\theta d\phi$

D : $V = \int \int \int_V r^2 \sin\theta drd\theta d\phi$

Q.no 49.

Axis of the right circular cylinder is $\frac{x-1}{2}=\frac{y+3}{-1}=\frac{z-2}{5}$ what are direction cosines of axis

A : $\alpha=\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

B : $\left(\frac{2}{\sqrt{30}},\frac{-1}{\sqrt{30}},\frac{5}{\sqrt{30}}\right)$

C : $\left(\frac{-2}{\sqrt{30}},\frac{1}{\sqrt{30}},\frac{-5}{\sqrt{30}}\right)$

D : $\left(\frac{2}{\sqrt{30}},\frac{1}{\sqrt{30}},\frac{5}{\sqrt{30}}\right)$

Q.no 50.

If $I(\alpha)=\int_a^b f(x,\alpha)\,dx$ where a, b are function of parameter α then by DUIS rule $\frac{dI(\alpha)}{d\alpha}$ is

A : $\int_a^b \frac{\partial}{\partial\alpha}f(x,\alpha)dx+f(a,\alpha)\frac{da}{d\alpha}-f(b,\alpha)\frac{db}{d\alpha}$

B : $\int_a^b \frac{\partial}{\partial\alpha}f(x,\alpha)dx+f(b,\alpha)\frac{db}{d\alpha}-f(a,\alpha)\frac{da}{d\alpha}$

C : $\int_a^b \frac{\partial}{\partial\alpha}f(x,\alpha)dx+f(b,\alpha)\frac{db}{d\alpha}-f(a,\alpha)\frac{da}{d\alpha}$

D : $\int_a^b \frac{\partial}{\partial\alpha}f(x,\alpha)dx$

Q.no 51.

Find the equation of right circular cone whose vertex is at origin, whose axis is the line $\frac{x}{2}=\frac{y}{-1}=\frac{z}{2}$ and semi-vertical angle $\frac{\pi}{4}$

A : $3(x^2+y^2+z^2)=4\,(2x-y+2z)^2$

B : $9(x^2+y^2+z^2) = 2\,(2x-y+2z)^2$

C : $6(x^2+y^2+z^2) = 2\,(2x-y+2z)^2$

D : $(x^2+y^2+z^2) = (2x-y+2z)^2$

Q.no 52. The value of integration $\int_0^1 \int_x^{\sqrt{x}} xydxdy$ is equal to

A : 0

B : -1/24

C : 1/24

D : 24

Q.no 53. The solution of exact DE $(x+2y-2)dx+(2x-y+3)dy=0$ is

A : $x^2+4xy-4x+6y=c$

B : $x^2+4xy-4x-y^2+6y=c$

C : $x^2+8xy+y^2=c$

D : $x^2+4xy-\frac{y^2}{2}+y=c$

Q.no 54. $B\left(\frac{1}{4},\frac{3}{4}\right)$ is equal to

A : $\frac{2\pi}{\sqrt{3}}$

B : $\frac{2\pi}{\sqrt{3}}$

C : 0

D : $\pi\sqrt{2}$

Q.no 55.
The value of integration $\int_0^1 \int_0^x (x^2 + y^2)\, dxdy$ is equal to

A : 4/3

B : 5/3

C : 2/3

D : 1

Q.no 56. q56.jpg

A : 1

B : 0

C : q56_3.jpg

D : q56_4.jpg

Q.no 57. In a circuit containing resistance R and inductance L in series with constant voltage source E current i is given by $i = \frac{E}{R}\left(1 - e^{-\frac{R}{L}t}\right)$, then maximum current $i_{\max}$ is

A : E/R

B : R/E

C : ER

D : 0

Q.no 58.
If the plane $2x - 2y + z + 12 = 0$ touches the sphere $x^2 + y^2 + z^2 - 2x - 4y + 2z - 3 = 0$ then the point of contact is given by—

A : (1, 4, 3)

B : (-1, 4, -2)

C : (0, 1,2)

D : (1,2,-1)

Q.no 59. The value of integration $\int_0^2 \int_0^{x^2} e^{\frac{y}{x}} dxdy$ is equal to

A : $e^2 - 2$

B : $2e^2 - 1$

C : $e^2 - 1$

D : $e^2 + 1$

Q.no 60.

The value of integration $\int_0^1 \int_{x^2}^{x} xy(x+y) dxdy$ is equal to

A : 3/15

B : 2/15

C : 4/15

D : 1/15

Answer for Question No 1. is c

Answer for Question No 2. is a

Answer for Question No 3. is b

Answer for Question No 4. is c

Answer for Question No 5. is b

Answer for Question No 6. is a

Answer for Question No 7. is a

Answer for Question No 8. is d

Answer for Question No 9. is b

Answer for Question No 10. is c

Answer for Question No 11. is b

Answer for Question No 12. is c

Answer for Question No 13. is c

Answer for Question No 14. is c

Answer for Question No 15. is c

Answer for Question No 16. is a

Answer for Question No 17. is c

Answer for Question No 18. is a

Answer for Question No 19. is a

Answer for Question No 20. is d

Answer for Question No 21. is b

Answer for Question No 22. is a

Answer for Question No 23. is b

Answer for Question No 24. is a

Answer for Question No 25. is b

Answer for Question No 26. is c

Answer for Question No 27. is d

Answer for Question No 28. is b

Answer for Question No 29. is b

Answer for Question No 30. is d

Answer for Question No 31. is c

Answer for Question No 32. is a

Answer for Question No 33. is a

Answer for Question No 34. is b

Answer for Question No 35. is d

Answer for Question No 36. is a

Answer for Question No 37. is a

Answer for Question No 38. is d

Answer for Question No 39. is a

Answer for Question No 40. is c

Answer for Question No 41. is a

Answer for Question No 42. is a

Answer for Question No 43. is a

Answer for Question No 44. is a

Answer for Question No 45. is b

Answer for Question No 46. is a

Answer for Question No 47. is a

Answer for Question No 48. is d

Answer for Question No 49. is b

Answer for Question No 50. is c

Answer for Question No 51. is b

Answer for Question No 52. is c

Answer for Question No 53. is b

Answer for Question No 54. is d

Answer for Question No 55. is c

Answer for Question No 56. is c

Answer for Question No 57. is a

Answer for Question No 58. is b

Answer for Question No 59. is c

Answer for Question No 60. is b

Seat No -

Total number of questions : 60

1000505 T1 ENGINEERING MATHEMATICS II

Time : 1hr

Max Marks : 50

N.B

1) All questions are Multiple Choice Questions having single correct option.

2) Attempt any 50 questions out of 60.

3) Use of calculator is allowed.

4) Each question carries 1 Mark.

5) Specially abled students are allowed 20 minutes extra for examination.

6) Do not use pencils to darken answer.

7) Use only black/blue ball point pen to darken the appropriate circle.

8) No change will be allowed once the answer is marked on OMR Sheet.

9) Rough work shall not be done on OMR sheet or on question paper.

10) Darken ONLY ONE CIRCLE for each answer.

Q.no 1. To change Cartesian coordinates (x, y, z) to spherical polar coordinate (r, θ, ϕ);$dxdydz$ is replaced by

A : To change Cartesian coordinates (x, y, z) to spherical polar coordinate (r, θ, ϕ);$dxdydz$ is replaced by

B : $r^2 \cos\theta drd\theta d\phi$

C : $r^2 drd\theta d\phi$

D : $rdrd\theta d\phi$

Q.no 2. If n is a positive integer, then $\Gamma(n+1)$ is

A : (n+1)!

B : (n+2)!

C : (n-1)!

D : n!

Q.no 3.

Fourier series representation of periodic function $f(x)$ with period 2π which satisfies the Dirichlet's conditions is

A : $\frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos nx + b_n \sin nx)$

B : $\frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos n\pi x + b_n \sin n\pi x)$

C : $\frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos nx)(b_n \sin nx)$

D : $\frac{a_0}{2} + (a_n \cos nx + b_n \sin nx)$

Q.no 4. A circuit containing inductance L capacitance C in series without applied electromotive force. By Kirchhoff's voltage law differential equation for current i is

A : $L\frac{di}{dt} + \frac{q}{c} = 0$

B : $L\frac{di}{dt} + Ri = 0$

C : $L\frac{di}{dt} + Ri = E$

D : $L\frac{di}{dt} + \frac{q}{c} = E$

Q.no 5. $erf(x) - erfc(x) = 1 \quad erfc(x) = ?$

A : $\frac{2}{\sqrt{\pi}} \int_0^x e^{-u^2} du$

B : $\frac{2}{\sqrt{\pi}}\int_{x}^{\infty} e^{-u^2}\,du$

C : $\frac{2}{\sqrt{\pi}}\int_{0}^{x^2} e^{-t}t^{-1/2}\,dt$

D : 0

Q.no 6. The value of $\int\int\int_V dxdydz$ where V is the volume bounded by $x^2+y^2+z^2=1$

A : $\frac{4}{3}\pi$

B : 4π

C : π

D : $\frac{1}{3}\pi$

Q.no 7. Reduction formula for gamma function is

A : $\Gamma(n+1)=(n-1)\Gamma(n-1)$

B : $\Gamma(n+1)=n\Gamma(n)$

C : $\Gamma(n+1)=(n-1)\Gamma(n)$

D : $\Gamma(n+1)=n\quad\Gamma(n-1)$

Q.no 8. If $I_n=\int_0^{\pi/2} sin^n x\,dx$, where n is positive even integer then I_n is calculated from

A : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}\dots\dots\frac{3}{4}.\frac{1}{2}$

B : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}\dots\dots\frac{3}{4}.\frac{1}{2}.\pi$

C : $\left(\frac{n+1}{n}.\frac{n.+3}{n+2.}.\frac{n+5}{n+4}\right)\dots\dots\frac{\pi}{2}$

D : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}\dots\dots\frac{3}{4}.\frac{1}{2}.\frac{\pi}{2}$

Q.no 9. Error function of x, $erf(x)$ is defined as

A : $\frac{2}{\sqrt{\pi}}\int_0^x e^{-u^2}du$

B : $\frac{2}{\sqrt{\pi}}\int_x^\infty e^{-u^2}du$

C : $\int_0^\infty e^{-x}x^{n-1}dx$

D : $\frac{2}{\sqrt{\pi}}\int_0^\infty e^{-u^2}du$

Q.no 10. The necessary and sufficient condition that the Differential equation $Mdx + Ndy = 0$ is exact is

A : $\frac{\partial M}{\partial y}=\frac{\partial N}{\partial x}$

B : $\frac{\partial M}{\partial x}=\frac{\partial N}{\partial y}$

C : $\frac{\partial M}{\partial y}\neq\frac{\partial N}{\partial x}$

D : $\frac{\partial M}{\partial x}=\frac{\partial N}{\partial x}$

Q.no 11. If double integral in Cartesian coordinate is given by $\int\int_R f(x,y)\,dxdy$ then the value of same integral in polar form is

A : $\int \int_R f(r\cos\theta, r\sin\theta)\, r dr d\theta$

B : $\int \int_R f(r\cos\theta, r\sin\theta)\, r dr d\theta$

C : $\int \int_R f(r\cos\theta, r\sin\theta)\, r^2 dr d\theta$

D : $\int \int_R f(r\sin\theta, r\cos\theta)\, r dr d\theta$

Q.no 12.

The equation of tangent to the curve at origin represented by the equation $y(1+x^2)=x$ is

A : y=x

B : x=0

C : x=1

D : y=0

Q.no 13. The integrating factor for the DE $\frac{dy}{dx}+\frac{x}{1+x}y=1+x$ is

A : $e^{x(1+x)}$

B : $e^{x(1+x)}$

C : $e^{x/(1+x)}$

D : $1+x^2$

Q.no 14. B(m,n) is equal to

A : $\int_0^1 x^{m-1}(1-x)^{n-1}dx$

B : $\int_0^\infty x^{m-1}(1-x)^{n-1}dx$

C : $\int_0^1 x^m (1-x)^n dx$

D : $\int_0^1 e^{-x} x^{n-1} dx$

Q.no 15. Rectilinear motion is a motion of body along a

A : Straight line

B : Circular path

C : Parabolic path

D : Hyperbolic path

Q.no 16. Moment of inertia of the lamina A about the x axis is equal to

A : $\int \int_A \rho x^2 dx dy$

B : $\int \int_A \rho y^2 dx dy$

C : $\int \int_A \rho(x^2 + y^2) dx dy$

D : $\int \int_A \rho x^2 y^2 dx dy$

Q.no 17. The value of λ for which the differential equation $(xy^2 + \lambda x^2 y)dx + (x+y)x^2 dy = 0$ is exact

A : 2

B : -3

C : 3

D : -2

Q.no 18. According to D'Alembert's principle algebraic sum of forces acting on a body along a given direction is equal to

A : Velocity x Acceleration

B : Mass x Velocity

C : Mass x displacement

D : Mass x Acceleration

Q.no 19. The integrating factor of $(y^4 + 2y)dx + (xy^3 + 2y^4 - 4x)dy = 0$ using non exact rule $\frac{\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)}{M}$ is

A : $\frac{1}{y^3}$

B : 1/x

C : y^3

D : $\frac{1}{x^3}$

Q.no 20. If the DE $Mdx + Ndy = 0$ can be written as $x^a y^b (mydx + nxdy) + x^r y^s (pydx + qxdy) = 0$ then integrating factor is

A : $x^h y^k$

B : x^h

C : xy

D : $\frac{1}{x^h y^k}$

Q.no 21. The solution of the DE $\frac{dy}{dx} = \frac{x^2}{y^3}$ is

A : $y^3 - x^3 = c$

B : $3y^4 - 4x^3 = c$

C : $y^2 - x^3 = c$

D : $x^2 - y^2 = c$

Q.no 22. Which of the following is true?

A : $erf(x) - erfc(x) = 1$

B : $erf(x) + erfc(x) = 1$

C : $erf(x) + erfc(x) = 2$

D : $erf(-x) = erf(x)$

Q.no 23. The integrating factor of the DE $\frac{dy}{dx} + ycosx = \frac{sin2x}{2}$ is

A : e^{cosx}

B : e^{sinx}

C : sin x

D : cos x

Q.no 24. A particle moving in straight line with acceleration $k(x + \frac{a^4}{x^3})$ directed towards origin. The equation of motion is

A : $\frac{dv}{dx} = -k(x + \frac{a^4}{x^3})$

B : $v\frac{dv}{dx} = k(x + \frac{a^4}{x^3})$

C : $v\frac{dv}{dx} = -k(x + \frac{a^4}{x^3})$

D : $\frac{dv}{dx} = (x + \frac{a^4}{x^3})$

Q.no 25. The integrating factor of $(3x^2y^4 + 2xy)dx + (2x^3y^3 - x^2)dy = 0$ using non exact rule $\frac{\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)}{M}$ is

A : y^2

B : $\frac{1}{y^2}$

C : y

D : 1/y

Q.no 26. Gamma function of n > 0 is defined as

A : $\int_0^\infty e^x x^{n-1}\,dx$

B : $\int_0^\infty e^x x^{n-1}\,dx$

C : $\int_0^\infty e^{-x} x^{n-1}\,dx$

D : $\int_0^\infty e^{-x} x^{1-n}\,dx$

Q.no 27. The general solution of Linear Differential equation $\frac{dx}{dy} + Px = Q$ where P and Q are functions of y or constants, is

A : $x\,e^{\int pdx} = \int Q\,e^{\int pdx}dx + c$

B : $x\,e^{\int pdy} = \int Q\,e^{\int pdy}dy + c$

C : $y\,e^{\int pdx} = \int Q\,e^{\int pdx}dx + c$

D : $y\,e^{\int pdx} = \int Q\,e^{\int pdx}dy + c$

Q.no 28.

Condition for the two spheres $x^2 + y^2 + z^2 + 2u_1x + 2v_1y + 2w_1z + d_1 = 0$ and $x^2 + y^2 + z^2 + 2u_2x + 2v_2y + 2w_2z + d_2 = 0$ to be orthogonal is ---

A : $S + \lambda U = 0$

B : $S_1 - S_2 = 0$

C : $2u_1u_2 + 2v_1v_2 + 2w_1w_2 = d_1 + d_2$

D : $u_1u_2 + v_1v_2 + w_1w_2 = d_1 + d_2$

Q.no 29. The integrating factor for the DE $(1+x^2)\frac{dy}{dx} + xy = 0$ is

A : e^{1+x^2}

B : $\log(x^2+1)$

C : $\sqrt{x^2+1}$

D : $1+x^2$

Q.no 30.

Equation of right circular cylinder whose radius is 'r' and axis is the line $\frac{x}{l} = \frac{y}{m} = \frac{z}{n}$ is

A : $x^2+y^2+z^2 = r^2 + \left(\frac{lx+my+nz}{\sqrt{l^2+m^2+n^2}}\right)^2$

B : $\alpha = \cos^{-1} 1$

C : $x^2+y^2+z^2 = r^2 + \frac{lx+my+nz}{\sqrt{l^2+m^2+n^2}}$

D : $(x+y+z) = r^2 + \left(\frac{lx+my+nz}{\sqrt{l^2+m^2+n^2}}\right)^2$

Q.no 31. The formula to find the length of the curve $r = f(\theta)$ from $\theta = \theta_1$ to $\theta = \theta_2$ is

A : $\int_{\theta_1}^{\theta_2} \sqrt{1 + \left(\frac{dr}{d\theta}\right)^2}\, d\theta$

B : $\int_{\theta_1}^{\theta_2} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\, d\theta$

C : $\int_{\theta_1}^{\theta_2} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\, dr$

D : $\int_{\theta_2}^{\theta_1} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\, d\theta$

Q.no 32. Half range Fourier cosine series for $f(x)$ defined in the interval $0 \le x \le L$ is

A : Half range Fourier cosine series for $f(x)$ defined in the interval $0 \le x \le L$ is

B : $\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos\frac{nx}{L}$

C : $\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos\frac{n\pi x}{L}$

D : $\frac{a_0}{2} + \sum_{n=1}^{\infty} \left(a_n\, cos\frac{n\pi x}{L} + b_n \sin\frac{n\pi x}{L}\right)$

Q.no 33. For RC circuit the charge q satisfies the linear D.E.

A : $R + \frac{dq}{dt} = E$

B : $Ri + q = 0$

C : $A = \frac{1}{3}\pi r^2 l$

D : $R\frac{dq}{dt} + \frac{q}{C} = E$

Q.no 34. The differential equation for the current i in an electric circuit containing resistance 100 ohm and an inductance of 0.5 henery connected in series with battery of 20 volts is

A : $0.5\frac{di}{dt} + 100i = 0$

B : $0.5\frac{di}{dt} + 100i = 20$

C : $100\frac{di}{dt} + 0.5i = 0$

D : $100\frac{di}{dt} + 0.5R = 0$

Q.no 35. The differential equation for the current i in an electric circuit containing resistance R=250 ohm and an inductance of L=640 henery in series with an electromotive force E=500 volts is

A : $640\frac{di}{dt} + 250i = 0$

B : $250\frac{di}{dt} + 640i = 500$

C : $640\frac{di}{dt} + 250i = 500$

D : $250\frac{di}{dt} + 640i = 0$

Q.no 36. The integrating factor of the DE $\frac{dx}{dy} + \frac{3}{y}x = \frac{1}{y^2}$

A : $-y^3$

B : y^3

C : x^2y

D : x^3

Q.no 37.

If $(\bar{x}, \bar{y})$ the coordinates of centroid of the plane area is given by

A : $\bar{x} = \frac{\int\int x\rho dxdy}{\int\int \rho dxdy}, \bar{y} = \frac{\int\int y\rho dxdy}{\int\int \rho dxdy}$

B : $\bar{x} = \frac{\int\int x^2 \rho dxdy}{\int\int \rho dxdy}, \bar{y} = \frac{\int\int y^2 \rho dxdy}{\int\int \rho dxdy}$

C : $\bar{x} = \frac{\int\int \rho dxdy}{\int\int x\rho dxdy}, \bar{y} = \frac{\int\int \rho dxdy}{\int\int y\rho dxdy}$

D : None of these

Q.no 38. If the equation of curve remains unchanged by replacing y by -y, then the curve is symmetric about

A : y-axis

B : line y=x

C : x-axis

D : line y=-x

Q.no 39. If $\phi(a) = \int_0^\infty e^{-bx^2} \cos(2ax)\, dx,\ b > 0$ then by DUIS rule $\frac{d\phi}{da}$ is

A : $\int_0^\infty \frac{\partial}{\partial b}\left[e^{-bx^2} \cos(2ax)\right] dx$

B : $e^{-bx^2} \cos(2ax)$

C : $\int_0^\infty \frac{\partial}{\partial x}\left[e^{-bx^2} \cos(2ax)\right] dx$

D : $\int_0^\infty \frac{\partial}{\partial a}\left[e^{-bx^2} \cos(2ax)\right] dx$

Q.no 40. Fourier law of heat conduction states that, the quantity of heat flow across an area A cm2 is

A : proportional to product of area A and temperature gradient dT/dx

B : inversely proportional to product of area A and temperature gradient dT/dx

C : equal to sum of area A and temperature gradient

D : equal to difference of area A and temperature gradient dT/dx

Q.no 41. Moment of inertia of the lamina A about the y axis is equal to

A : $\int \int_A \rho x^2 dx dy$

B : $\int \int_A \rho y^2 dx dy$

C : $\int \int_A \rho (x^2 + y^2) dx dy$

D : $\int \int_A \rho x^2 y^2 dx dy$

Q.no 42. The value of the integral $\int_0^b e^{-u^2} du$ is

A : $\frac{2}{\sqrt{\pi}} \int_0^x e^{-u^2} du$

B : $\frac{\sqrt{\pi}}{2} erf\ (b)$

C : $\frac{2}{\sqrt{\pi}} erf_c (b)$

D : $erf\ (b)$

Q.no 43.

The two spheres $x^2 + y^2 + z^2 - 12x - 18y - 24z + 29 = 0$ and $x^2 + y^2 + z^2 + 3x - 3y + 3z - 56 = 0$

A : touches each other internally

B : touches each other externally

C : touches each other Orthogonally

D : Intersecting each other

Q.no 44. The value of integration $\int_0^1 \int_0^{x^2} x e^y dx dy$ is equal to

A : e/2

B : e-1

C : 1-e

D : (e/2)-1

Q.no 45. q56.jpg

A : 1

B : 0

C : q56_3.jpg

D : q56_4.jpg

Q.no 46.

Axis of the right circular cylinder is $\frac{x-1}{2} = \frac{y+3}{-1} = \frac{z-2}{5}$ what are direction cosines of axis

A : $\alpha = \cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

B : $\left(\frac{2}{\sqrt{30}}, \frac{-1}{\sqrt{30}}, \frac{5}{\sqrt{30}}\right)$

C : $\left(\frac{-2}{\sqrt{30}}, \frac{1}{\sqrt{30}}, \frac{-5}{\sqrt{30}}\right)$

D : $\left(\frac{2}{\sqrt{30}}, \frac{1}{\sqrt{30}}, \frac{5}{\sqrt{30}}\right)$

Q.no 47. In a circuit containing resistance R and inductance L in series with constant voltage source E current i is given by $i = \frac{E}{R}\left(1 - e^{-\frac{R}{L}t}\right)$, then maximum current $i_{\max}$ is

A : E/R

B : R/E

C : ER

D : 0

Q.no 48. The solution of exact DE $(x+2y-2)dx+(2x-y+3)dy=0$ is

A : $x^2+4xy-4x+6y=c$

B : $x^2+4xy-4x-y^2+6y=c$

C : $x^2+8xy+y^2=c$

D : $x^2+4xy-\frac{y^2}{2}+y=c$

Q.no 49. The value of integration $\int_0^1 \int_0^x (x^2+y^2)\,dxdy$ is equal to

A : 4/3

B : 5/3

C : 2/3

D : 1

Q.no 50.

The equation of sphere which passes through the point (4, 6, 3) and passes through the circle $(x-1)^2+(y-2)^2=25$, $z=0$ is

A : $x^2+y^2+z^2-2x-4y-3z-20=0$

B : $x^2+y^2+z^2+3x-4y+3z-16=0$

C : $2x^2+2y^2+2z^2+6x-3y+2z=0$

D : $x^2+y^2+z^2+4x-4y+3z-20=0$

Q.no 51. $B\left(\frac{1}{4},\frac{3}{4}\right)$ is equal to

A : $\frac{2\pi}{\sqrt{3}}$

B : $\frac{2\pi}{\sqrt{3}}$

C : 0

D : $\pi\sqrt{2}$

Q.no 52. The value of $erf(0)+erf(\infty)$ is

A : 1

B : -1

C : 0

D : ∞

Q.no 53.

If the plane $4x - 3y + 6z - 35 = 0$ is tangential to the sphere

$x^2 + y^2 + z^2 - y - 2z - 14 = 0$ then the length of perpendicular from any point P on the plane is---

A : $\frac{61}{2}$

B : $\frac{61}{2}$

C : 30

D : $-\frac{\sqrt{61}}{2}$

Q.no 54. Radius of right circular cylinder is 5and whose axis is the line $\frac{x-2}{3} = \frac{y-3}{1} = \frac{z+1}{1}$ Then the equation of right circular cylinder is

A : $(x+2)^2 + (y+3)^2 + (z+1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

B : $(x-2)^2 + (y-3)^2 + (z-1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

C : $(x+2)^2 + (y-3)^2 + (z+1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

D : $(x-2)^2 + (y-3)^2 + (z+1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

Q.no 55. If $I(\alpha) = \int_0^1 \frac{x^\alpha - 1}{\log x} dx$, $\alpha \geq 0$ then by DUIS $\frac{dI}{d\alpha}$ is

A : $\log(\alpha+1)$

B : $\log(\alpha-1)$

C : $\log\alpha$

D : 0

Q.no 56. The value of integration $\int_0^1 \int_x^{\sqrt{x}} xydxdy$ is equal to

A : 0

B : -1/24

C : 1/24

D : 24

Q.no 57. In spherical co-ordinates volume is given by

A : $V = \int\int\int_V drd\theta d\phi$

B : $V = \int\int\int_V rdrd\theta d\phi$

C : $V = \int\int\int_V r^2 \cos\theta drd\theta d\phi$

D : $V = \int\int\int_V r^2 \sin\theta drd\theta d\phi$

Q.no 58. $\int_0^{\pi/2} cos^6 x\, dx$ is equal to

A : $\frac{5}{16}$

B : $\frac{16}{5}.\frac{\pi}{2}$

C : $\frac{5}{16}.\frac{\pi}{2}$

D : $\frac{5}{48}.\frac{\pi}{2}$

Q.no 59. The value of integration $\int_0^2 \int_0^{x^2} e^{\frac{y}{x}} dxdy$ is equal to

A : $e^2 - 2$

B : $2e^2 - 1$

C : $e^2 - 1$

D : $e^2 + 1$

Q.no 60. The value of a_0 in harmonic analysis of y for the following tabulated data is

x	0	1	2	3	4	5	6
y	9	18	24	28	26	20	9

A : 17.85

B : 20.83

C : 35.71

D : 41.66

Answer for Question No 1. is a

Answer for Question No 2. is d

Answer for Question No 3. is b

Answer for Question No 4. is a

Answer for Question No 5. is b

Answer for Question No 6. is a

Answer for Question No 7. is b

Answer for Question No 8. is d

Answer for Question No 9. is a

Answer for Question No 10. is a

Answer for Question No 11. is a

Answer for Question No 12. is a

Answer for Question No 13. is c

Answer for Question No 14. is a

Answer for Question No 15. is a

Answer for Question No 16. is b

Answer for Question No 17. is c

Answer for Question No 18. is d

Answer for Question No 19. is a

Answer for Question No 20. is a

Answer for Question No 21. is b

Answer for Question No 22. is b

Answer for Question No 23. is b

Answer for Question No 24. is c

Answer for Question No 25. is b

Answer for Question No 26. is c

Answer for Question No 27. is b

Answer for Question No 28. is c

Answer for Question No 29. is b

Answer for Question No 30. is a

Answer for Question No 31. is b

Answer for Question No 32. is c

Answer for Question No 33. is d

Answer for Question No 34. is b

Answer for Question No 35. is c

Answer for Question No 36. is b

Answer for Question No 37. is a

Answer for Question No 38. is c

Answer for Question No 39. is d

Answer for Question No 40. is a

Answer for Question No 41. is a

Answer for Question No 42. is b

Answer for Question No 43. is c

Answer for Question No 44. is b

Answer for Question No 45. is c

Answer for Question No 46. is b

Answer for Question No 47. is a

Answer for Question No 48. is b

Answer for Question No 49. is c

Answer for Question No 50. is a

Answer for Question No 51. is d

Answer for Question No 52. is a

Answer for Question No 53. is a

Answer for Question No 54. is d

Answer for Question No 55. is a

Answer for Question No 56. is c

Answer for Question No 57. is d

Answer for Question No 58. is c

Answer for Question No 59. is c

Answer for Question No 60. is d

Seat No -

Total number of questions : 60

1000505 T1 ENGINEERING MATHEMATICS II

Time : 1hr

Max Marks : 50

N.B

1) All questions are Multiple Choice Questions having single correct option.

2) Attempt any 50 questions out of 60.

3) Use of calculator is allowed.

4) Each question carries 1 Mark.

5) Specially abled students are allowed 20 minutes extra for examination.

6) Do not use pencils to darken answer.

7) Use only black/blue ball point pen to darken the appropriate circle.

8) No change will be allowed once the answer is marked on OMR Sheet.

9) Rough work shall not be done on OMR sheet or on question paper.

10) Darken ONLY ONE CIRCLE for each answer.

Q.no 1. To change Cartesian coordinates (x, y, z) to spherical polar coordinate (r, θ, ϕ);$dxdydz$ is replaced by

A : To change Cartesian coordinates (x, y, z) to spherical polar coordinate (r, θ, ϕ);$dxdydz$ is replaced by

B : $r^2 \cos\theta dr d\theta d\phi$

C : $r^2 dr d\theta d\phi$

D : $r dr d\theta d\phi$

Q.no 2. Which of the following is true?

A : $erf(x) - erfc(x) = 1$

B : $erf(x) + erfc(x) = 1$

C : $erf(x) + erfc(x) = 2$

D : $erf(-x) = erf(x)$

Q.no 3. A circuit containing inductance L capacitance C in series with applied electromotive force E. By Kirchhoff's voltage law differential equation for current i is

A : $L\frac{di}{dt} + Ri = E$

B : $L\frac{di}{dt} + Ri = 0$

C : $L\frac{di}{dt} + \frac{q}{C} = E$

D : $L\frac{di}{dt} + \frac{q}{C} = 0$

Q.no 4. A pipe contains steam and is protected with a covering then in the formula $q = kA\,\frac{dT}{dt}$

A : $A = 2\pi r l$

B : $A = \frac{1}{3}\pi r^2 l$

C : $A = \frac{1}{3}\pi r^2 l$

D : $A = rl$

Q.no 5. Moment of inertia of the lamina A about the y axis is equal to

A : $\int\int_A \rho x^2\,dx\,dy$

B : $\int\int_A \rho y^2 dxdy$

C : $\int\int_A \rho(x^2+y^2)dxdy$

D : $\int\int_A \rho x^2y^2 dxdy$

Q.no 6. The formula to find the length of the curve $r=f(\theta)$ from $\theta=\theta_1$ to $\theta=\theta_2$ is

A : $\int_{\theta_1}^{\theta_2} \sqrt{1+\left(\frac{dr}{d\theta}\right)^2}\, d\theta$

B : $\int_{\theta_1}^{\theta_2} \sqrt{r^2+\left(\frac{dr}{d\theta}\right)^2}\, d\theta$

C : $\int_{\theta_1}^{\theta_2} \sqrt{r^2+\left(\frac{dr}{d\theta}\right)^2}\, dr$

D : $\int_{\theta_2}^{\theta_1} \sqrt{r^2+\left(\frac{dr}{d\theta}\right)^2}\, d\theta$

Q.no 7. The amount of heat Q flowing through the area per unit time is

A : Q = thermal conductivity x Area x Rate of change of temp. across an area

B : Q = thermal conductivity x Area of slab

C : Q = thermal conductivity x Area x temp. gradient

D : Q = thermal conductivity x Area + Rate of flow of heat

Q.no 8. The integrating factor of $(y^4+2y)dx+(xy^3+2y^4-4x)dy=0$ using non exact rule $\frac{\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)}{M}$ is

A : $\frac{1}{y^3}$

B : 1/x

C : y^3

D : $\frac{1}{x^3}$

Q.no 9.

Find semi-vertical angle for a right circular cone with vertex at the point (1,0,1)which passes through the point (1,1,1) and axis of cone has direction ratios 1,1,1

A : $\alpha = \cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

B : $\alpha = \cos^{-1} 1$

C : $\alpha = \sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

D : $\alpha = \cos^{-1}(\sqrt{3})$

In a D.E. $L\frac{di}{dt} + Ri = E$, E means

Q.no 10.

A : Voltage

B : Current

C : Resistance

D : Electromotive force

The center and radius of the sphere $3(x^2 + y^2 + z^2) - 30x + 12y - 18z + 89 = 0$ is

Q.no 11.

A : (10,-4,6) , $\frac{5}{\sqrt{3}}$

B : $(15,-6,9)$, $\frac{\sqrt{203}}{\sqrt{3}}$

C : $(5,-2,3)$, $\frac{5}{\sqrt{3}}$

D : $(-5,2,-3)$, $\frac{5}{3}$

Q.no 12. The value of $erf\left(3\right)+erf_{c}\left(3\right)$ is

A : 3

B : 2

C : 1

D : 0

Q.no 13. If double integral in Cartesian coordinate is given by $\int\int_R f(x,y)\,dxdy$ then the value of same integral in polar form is

A : $\int\int_R f(r\cos\theta, r\sin\theta)\,rdrd\theta$

B : $\int\int_R f(r\cos\theta, r\sin\theta)\,rdrd\theta$

C : $\int\int_R f(r\cos\theta, r\sin\theta)\,r^2drd\theta$

D : $\int\int_R f(r\sin\theta, r\cos\theta)\,rdrd\theta$

Q.no 14.

The formula to find the length of the curve $y=f(x)$ from $x=a$ to $x=b$ is $s=$

A : $\int_a^b \sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dx$

B : $\int_a^b \sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dy$

C : $\int_a^b \sqrt{a^2 + \left(\frac{dy}{dx}\right)^2}\, dx$

D : $\int_a^b \sqrt{a^2 + b^2\left(\frac{dy}{dx}\right)^2}\, dy$

Q.no 15. $\int_0^{\pi/2} sin^p\theta cos^q\theta\, d\theta$ is equal to

A : $B\left(\frac{p-1}{2}, \frac{q-1}{2}\right)$

B : $\frac{1}{2}B\left(\frac{p+1}{2}, \frac{q+1}{2}\right)$

C : $B\left(\frac{p+1}{2}, \frac{q+1}{2}\right)$

D : $B(p,q)$

Q.no 16. The value of λ for which the differential equation $(xy^2 + \lambda x^2 y)dx + (x+y)x^2 dy = 0$ is exact

A : 2

B : -3

C : 3

D : -2

Q.no 17. The value of integration $\int_0^a \int_0^b \int_0^c x^2y^2z^2 dxdydz$ is equal to

A : $\frac{abc}{3}$

B : $\frac{a^2b^2c^2}{3}$

C : $\frac{a^3b^3c^3}{27}$

D : $\frac{a^2b^2c^2}{9}$

Q.no 18. If the sphere $x^2 + y^2 + z^2 = 25$,

$x^2 + y^2 + z^2 - 18x - 24y - 40z + 225 = 0$

touches each other externally then distance between their centers is:

A : 20

B : 5

C : 15

D : 25

Q.no 19. The integrating factor of the DE $\frac{dy}{dx} + ycosx = \frac{sin2x}{2}$ is

A : e^{cosx}

B : e^{sinx}

C : sin x

D : cos x

Q.no 20. Error function of x , $erf(x)$ is defined as

A : $\frac{2}{\sqrt{\pi}}\int_0^x e^{-u^2}du$

B : $\frac{2}{\sqrt{\pi}}\int_x^\infty e^{-u^2}du$

C : $\int_0^\infty e^{-x}x^{n-1}dx$

D : $\frac{2}{\sqrt{\pi}}\int_0^{\infty} e^{-u^2} du$

Q.no 21. The differential equation for the current i in an electric circuit containing resistance R=250 ohm and an inductance of L=640 henery in series with an electromotive force E=500 volts is

A : $640\frac{di}{dt} + 250i = 0$

B : $250\frac{di}{dt} + 640i = 500$

C : $640\frac{di}{dt} + 250i = 500$

D : $250\frac{di}{dt} + 640i = 0$

Q.no 22. Rectilinear motion is a motion of body along a

A : Straight line

B : Circular path

C : Parabolic path

D : Hyperbolic path

Q.no 23. The integrating factor of $(x^2 + y^2 + x)dx + xydy = 0$ using non exact rule $\frac{\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)}{N}$ is

A : x

B : 1/x

C : x2

D : xy

Q.no 24. If n is a positive integer, then $\Gamma(n+1)$ is

A : (n+1)!

B : (n+2)!

C : (n-1)!

D : n!

Q.no 25. Voltage drop across inductance L is given by

A : Li

B : L di/dt

C : dL/dt

D : L dL/dt

Q.no 26. Fourier law of heat conduction states that, the quantity of heat flow across an area A cm2 is

A : proportional to product of area A and temperature gradient dT/dx

B : inversely proportional to product of area A and temperature gradient dT/dx

C : equal to sum of area A and temperature gradient

D : equal to difference of area A and temperature gradient dT/dx

Q.no 27. A circuit containing inductance L capacitance C in series without applied electromotive force. By Kirchhoff's voltage law differential equation for current i is

A : $L\frac{di}{dt}+\frac{q}{c}=0$

B : $L\frac{di}{dt}+Ri=0$

C : $L\frac{di}{dt}+Ri=E$

D : $L\frac{di}{dt}+\frac{q}{c}=E$

Q.no 28. If the DE $Mdx+Ndy=0$ can be written as $x^a y^b(mydx+nxdy)+x^r y^s(pydx+qxdy)=0$ then integrating factor is

A : $x^h y^k$

B : x^h

C : xy

D : $\frac{1}{x^h y^k}$

Q.no 29. The general solution of Linear Differential equation $\frac{dx}{dy} + Px = Q$ where P and Q are functions of y or constants, is

A : $x\, e^{\int p dx} = \int Q\, e^{\int p dx} dx + c$

B : $x\, e^{\int p dy} = \int Q\, e^{\int p dy} dy + c$

C : $y\, e^{\int p dx} = \int Q\, e^{\int p dx} dx + c$

D : $y\, e^{\int p dx} = \int Q\, e^{\int p dx} dy + c$

Q.no 30. The integrating factor of the DE $\frac{dx}{dy} + \frac{3}{y}x = \frac{1}{y^2}$

A : $-y^3$

B : y^3

C : $x^2 y$

D : x^3

Q.no 31.

If $(\bar{x}, \bar{y})$ the coordinates of centroid of the plane area is given by

A : $\bar{x} = \frac{\int\int x\rho dxdy}{\int\int \rho dxdy}, \bar{y} = \frac{\int\int y\rho dxdy}{\int\int \rho dxdy}$

B : $\bar{x} = \frac{\int\int x^2\rho dxdy}{\int\int \rho dxdy}, \bar{y} = \frac{\int\int y^2\rho dxdy}{\int\int \rho dxdy}$

C : $\bar{x} = \frac{\int\int \rho dxdy}{\int\int x\rho dxdy}, \bar{y} = \frac{\int\int \rho dxdy}{\int\int y\rho dxdy}$

D : None of these

Q.no 32. Half range Fourier cosine series for $f(x)$ defined in the interval $0 \le x \le L$ is

A : Half range Fourier cosine series for $f(x)$ defined in the interval $0 \le x \le L$ is

B : $\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos\frac{nx}{L}$

C : $\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos\frac{n\pi x}{L}$

D : $\frac{a_0}{2} + \sum_{n=1}^{\infty} \left(a_n\, cos\frac{n\pi x}{L} + b_n \sin\frac{n\pi x}{L}\right)$

Q.no 33. If $I_n = \int_0^{\pi/2} sin^n x\, dx$, where n is positive even integer then I_n is calculated from

A : $\frac{n-1}{n} \cdot \frac{n-3}{n-2.} \cdot \frac{n-5}{n-4} \cdots\cdots \frac{3}{4} \cdot \frac{1}{2}$

B : $\frac{n-1}{n} \cdot \frac{n-3}{n-2.} \cdot \frac{n-5}{n-4} \cdots\cdots \frac{3}{4} \cdot \frac{1}{2} \cdot \pi$

C : $\left(\frac{n+1}{n} \cdot \frac{n.+3}{n+2.} \cdot \frac{n+5}{n+4}\right) \cdots\cdots \frac{\pi}{2}$

D : $\frac{n-1}{n} \cdot \frac{n-3}{n-2.} \cdot \frac{n-5}{n-4} \cdots\cdots \frac{3}{4} \cdot \frac{1}{2} \cdot \frac{\pi}{2}$

Q.no 34. The value of $\int\int\int_V dxdydz$ where V is the volume bounded by $x^2 + y^2 + z^2 = 1$

A : $\frac{4}{3}\pi$

B : 4π

C : π

D : $\frac{1}{3}\pi$

Q.no 35. If the equation of curve remains unchanged by replacing y by -y, then the curve is symmetric about

A : y-axis

B : line y=x

C : x-axis

D : line y=-x

Q.no 36. If the differential equation $M(x,y)dx + N(x,y)dy = 0$ is not exact and it can be written as $yf_1(x,y)dx + xf_2(x,y)dy = 0$ then integrating factor is

A : $\frac{1}{My+Nx}; My+Nx \neq 0$

B : $\frac{1}{Mx+Ny}; Mx+Ny \neq 0$

C : $\frac{1}{Mx-Ny}; Mx-Ny \neq 0$

D : $\frac{1}{My-Nx}; My-Nx \neq 0$

Q.no 37.

The equation of tangent to the curve at origin represented by the equation $y(1+x^2) = x$ is

A : y=x

B : x=0

C : x=1

D : y=0

Q.no 38. If $\phi(a)=\int_0^\infty e^{-bx^2}\cos(2ax)\,dx,\ b>0$ then by DUIS rule $\frac{d\phi}{da}$ is

A : $\int_0^\infty \frac{\partial}{\partial b}\left[e^{-bx^2}\cos(2ax)\right]dx$

B : $e^{-bx^2}\cos(2ax)$

C : $\int_0^\infty \frac{\partial}{\partial x}\left[e^{-bx^2}\cos(2ax)\right]dx$

D : $\int_0^\infty \frac{\partial}{\partial a}\left[e^{-bx^2}\cos(2ax)\right]dx$

Q.no 39. If $I(\alpha)=\int_a^b f(x,\alpha)\,dx$ where α is parameter and $a,\ b$ are constants then by DUIS rule $\frac{dI(\alpha)}{d\alpha}$ is

A : $\int_a^b \frac{\partial}{\partial \alpha} f(x,\alpha)dx$

B : $\int_a^b \frac{\partial}{\partial x} f(x,\alpha)dx$

C : $f(b,\alpha)-f(a,\alpha)$

D : $f(x,\alpha)$

Q.no 40. Reduction formula for gamma function is

A : $\Gamma(n+1)=(n-1)\Gamma(n-1)$

B : $\Gamma(n+1) = n\Gamma(n)$

C : $\Gamma(n+1) = (n-1)\Gamma(n)$

D : $\Gamma(n+1) = n \quad \Gamma(n-1)$

Q.no 41. Area enclosed by the polar curve $r = f_1(\theta)$ and $r = f_2(\theta)$ and the line $\theta = \alpha, \theta = \beta \alpha < \beta$ is given by

A : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} r dr d\theta$

B : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} dr d\theta$

C : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} r^2 \sin\theta dr d\theta$

D : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} r^2 \cos\theta dr d\theta$

Q.no 42. The differential equation for the current in an electric circuit containing resistance R and inductance L in series with voltage source E sin(wt) is

A : $L\frac{di}{dt} + \frac{q}{C} = E$

B : $Li + R\frac{di}{dt} = Esin\omega t$

C : $L\frac{di}{dt} + Ri = 0$

D : $L\frac{di}{dt} + Ri = 0$

Q.no 43. If $I(\alpha) = \int_0^1 \frac{x^\alpha - 1}{\log x} dx$, $\alpha \geq 0$ then by DUIS $\frac{dI}{d\alpha}$ is

A : $\log(\alpha + 1)$

B : $\log(\alpha - 1)$

C : $\log \alpha$

D : 0

Q.no 44.
The radius of the circle of intersection of the sphere $x^2 + y^2 + z^2 - 2x + 4y + 2z - 6 = 0$ by the plane $x + 2y + 2z - 4 = 0$ is:

[Centre of the circle is(2,0,1)]

A : 9

B : 3

C : 12

D : $\sqrt{3}$

Q.no 45. The solution of exact DE $(x + 2y - 2)dx + (2x - y + 3)dy = 0$ is

A : $x^2 + 4xy - 4x + 6y = c$

B : $x^2 + 4xy - 4x - y^2 + 6y = c$

C : $x^2 + 8xy + y^2 = c$

D : $x^2 + 4xy - \frac{y^2}{2} + y = c$

Q.no 46. B(4,5)=

A : 1/280

B : 4/105

C : 1/70

D : 1/210

Q.no 47. In a circuit containing resistance R and inductance L in series with constant voltage source E current i is given by $i = \frac{E}{R}\left(1 - e^{-\frac{R}{L}t}\right)$, then maximum current $i_{\max}$ is

A : E/R

B : R/E

C : ER

D : 0

Q.no 48. If $I(\alpha) = \int_0^1 \frac{x^\alpha - 1}{\log x} dx$, $\alpha \geq 0$ then by DUIS $\frac{dI}{d\alpha}$ is

A : $\int_0^1 \log x \, dx$

B : $\int_0^1 x^\alpha \log x \, dx$

C : $\int_0^1 x^\alpha dx$

D : $\int_0^1 x^{-\alpha} dx$

Q.no 49. Radius of right circular cylinder is 2 and direction ratios 2,-1,5 and fixed point on axis of the line (1,-3,2)then the equation of right circular cylinder is

A : $(x+1)^2 + (y+3)^2 + (z-2)^2 = 2^2 + \left(\frac{2x - y + 5z - 15}{\sqrt{30}}\right)^2$

B : $(x+1)^2 + (y+3)^2 + (z-2)^2 = 2^2 + \left(\frac{2x - y + 5z - 15}{\sqrt{30}}\right)^2$

C : $(x-1)^2 + (y+3)^2 - (z-2)^2 = 2^2 + \left(\frac{2x-y-5z-15}{\sqrt{30}}\right)^2$

D : $(x-1)^2 + (y+3)^2 + (z-2)^2 = 2^2 + \left(\frac{2x-y+5z-15}{\sqrt{30}}\right)^2$

Q.no 50.

The value of integration $\int_0^1 \int_0^1 \int_0^1 xyzdxdydz$ is equal to

A : 0.125

B : 0.25

C : -0.125

D : 1

Q.no 51. The value of integration $\int_0^1 \int_0^{x^2} xe^y dxdy$ is equal to

A : e/2

B : e-1

C : 1-e

D : (e/2)-1

Q.no 52. If $I_n = \int_0^{\pi/2} cos^n x\, dx$ then which of the following relation is true?

A : $\frac{n-1}{n} \cdot \frac{n-3}{n-2.} \cdot \frac{n-5}{n-4} \cdots\cdots \frac{3}{4} \cdot \frac{1}{2}$

B : $I_n = \frac{n}{n-1} I_{n-2}$

C : $I_n = \frac{n-1}{n} I_{n-2}$

D : $I_n = n(n+1) I_{n-1}$

Q.no 53.

Axis of the right circular cylinder is $\frac{x-1}{2}=\frac{y+3}{-1}=\frac{z-2}{5}$ what are direction cosines of axis

A : $\alpha=\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

B : $\left(\frac{2}{\sqrt{30}},\frac{-1}{\sqrt{30}},\frac{5}{\sqrt{30}}\right)$

C : $\left(\frac{-2}{\sqrt{30}},\frac{1}{\sqrt{30}},\frac{-5}{\sqrt{30}}\right)$

D : $\left(\frac{2}{\sqrt{30}},\frac{1}{\sqrt{30}},\frac{5}{\sqrt{30}}\right)$

Q.no 54.

If $I(\alpha)=\int_a^b f(x,\alpha)dx$ where a, b are function of parameter α then by DUIS rule $\frac{dI(\alpha)}{d\alpha}$ is

A : $\int_a^b \frac{\partial}{\partial\alpha}f(x,\alpha)dx+f(a,\alpha)\frac{da}{d\alpha}-f(b,\alpha)\frac{db}{d\alpha}$

B : $\int_a^b \frac{\partial}{\partial\alpha}f(x,\alpha)dx+f(b,\alpha)\frac{db}{d\alpha}-f(a,\alpha)\frac{da}{d\alpha}$

C : $\int_a^b \frac{\partial}{\partial\alpha}f(x,\alpha)dx+f(b,\alpha)\frac{db}{d\alpha}-f(a,\alpha)\frac{da}{d\alpha}$

D : $\int_a^b \frac{\partial}{\partial\alpha}f(x,\alpha)dx$

Q.no 55.

A particle of mass m moves in a horizontal straight line OA with acceleration $\frac{k}{x^3}$ at a distance x and directed towards origin O. Then the differential equation of motion is

A : $v\frac{dv}{dx}=\frac{k}{x^3}$

B : $v\frac{dv}{dx}=-\frac{k}{x^3}$

C : $\frac{dv}{dx}=-\frac{k}{x^3}$

D : $\frac{dv}{dx}=\frac{k}{x^3}$

Q.no 56. The value of $erf(0)+erf(\infty)$ is

A : 1

B : -1

C : 0

D : ∞

Q.no 57.

Area bounded by the parabola $y^2 = 4x$ and the line $y = x$ is calculated using

A : $\int_{y=0}^{4}\int_{x=y^2/4}^{y} dxdy$

B : $\int_{y=0}^{4}\int_{x=0}^{4} dxdy$

C : $\int_{y=0}^{4}\int_{x=0}^{y} dxdy$

D : $\int_{x=0}^{4}\int_{y=0}^{x} dxdy$

Fourier coefficient a_0 in the Fourier series expansion of

Q.no 58. $f(x) = x\sin x\,;\, 0 \le x \le 2\pi$ and $f(x+2\pi) = f(x)$

A : 2

B : 0

C : -2

D : -4

Q.no 59. The value of a_0 in harmonic analysis of y for the following tabulated data is

x	0	1	2	3	4	5	6
y	9	18	24	28	26	20	9

A : 17.85

B : 20.83

C : 35.71

D : 41.66

Q.no 60. The value of integration $\int_0^2 \int_0^{x^2} e^{\frac{y}{x}} dxdy$ is equal to

A : $e^2 - 2$

B : $2e^2 - 1$

C : $e^2 - 1$

D : $e^2 + 1$

Answer for Question No 1. is a

Answer for Question No 2. is b

Answer for Question No 3. is c

Answer for Question No 4. is a

Answer for Question No 5. is a

Answer for Question No 6. is b

Answer for Question No 7. is c

Answer for Question No 8. is a

Answer for Question No 9. is a

Answer for Question No 10. is d

Answer for Question No 11. is c

Answer for Question No 12. is c

Answer for Question No 13. is a

Answer for Question No 14. is a

Answer for Question No 15. is b

Answer for Question No 16. is c

Answer for Question No 17. is c

Answer for Question No 18. is d

Answer for Question No 19. is b

Answer for Question No 20. is a

Answer for Question No 21. is c

Answer for Question No 22. is a

Answer for Question No 23. is a

Answer for Question No 24. is d

Answer for Question No 25. is b

Answer for Question No 26. is a

Answer for Question No 27. is a

Answer for Question No 28. is a

Answer for Question No 29. is b

Answer for Question No 30. is b

Answer for Question No 31. is a

Answer for Question No 32. is c

Answer for Question No 33. is d

Answer for Question No 34. is a

Answer for Question No 35. is c

Answer for Question No 36. is c

Answer for Question No 37. is a

Answer for Question No 38. is d

Answer for Question No 39. is a

Answer for Question No 40. is b

Answer for Question No 41. is a

Answer for Question No 42. is d

Answer for Question No 43. is a

Answer for Question No 44. is d

Answer for Question No 45. is b

Answer for Question No 46. is a

Answer for Question No 47. is a

Answer for Question No 48. is c

Answer for Question No 49. is d

Answer for Question No 50. is a

Answer for Question No 51. is b

Answer for Question No 52. is c

Answer for Question No 53. is b

Answer for Question No 54. is c

Answer for Question No 55. is b

Answer for Question No 56. is a

Answer for Question No 57. is a

Answer for Question No 58. is c

Answer for Question No 59. is d

Answer for Question No 60. is c

Seat No -

Total number of questions : 60

1000505 T1 ENGINEERING MATHEMATICS II

Time : 1hr

Max Marks : 50

N.B

1) All questions are Multiple Choice Questions having single correct option.

2) Attempt any 50 questions out of 60.

3) Use of calculator is allowed.

4) Each question carries 1 Mark.

5) Specially abled students are allowed 20 minutes extra for examination.

6) Do not use pencils to darken answer.

7) Use only black/blue ball point pen to darken the appropriate circle.

8) No change will be allowed once the answer is marked on OMR Sheet.

9) Rough work shall not be done on OMR sheet or on question paper.

10) Darken ONLY ONE CIRCLE for each answer.

Q.no 1. The differential equation for the current i in an electric circuit containing resistance R=250 ohm and an inductance of L=640 henery in series with an electromotive force E=500 volts is

A : $640\frac{di}{dt} + 250i = 0$

B : $250\frac{di}{dt} + 640i = 500$

C : $640\frac{di}{dt} + 250i = 500$

D : $250\frac{di}{dt} + 640i = 0$

Q.no 2. The general solution of Linear Differential equation $\frac{dx}{dy} + Px = Q$ where P and Q are functions of y or constants, is

A : $x\, e^{\int p dx} = \int Q\, e^{\int p dx} dx + c$

B : $x\, e^{\int p dy} = \int Q\, e^{\int p dy} dy + c$

C : $y\, e^{\int p dx} = \int Q\, e^{\int p dx} dx + c$

D : $y\, e^{\int p dx} = \int Q\, e^{\int p dx} dy + c$

Q.no 3.

The equation of asymptotes parallel to y-axis to the curve represented by the equation $y^2(4-x) = x(x-2)^2$ is

A : x=2

B : y=0

C : x=4

D : x=0

Q.no 4. The integrating factor of $\frac{dy}{dx} + Py = Q$ is

A : $e^{\int p dx}$

B : $e^{\int p dy}$

C : $e^{\int Q dx}$

D : $e^{\int Q dy}$

Q.no 5. The value of $erf\,(3) + erf_c\,(3)$ is

A : 3

B : 2

C : 1

D : 0

Q.no 6. A circuit containing inductance L capacitance C in series without applied electromotive force. By Kirchhoff's voltage law differential equation for current i is

A : $L\frac{di}{dt}+\frac{q}{c}=0$

B : $L\frac{di}{dt}+Ri=0$

C : $L\frac{di}{dt}+Ri=E$

D : $L\frac{di}{dt}+\frac{q}{c}=E$

Q.no 7. The necessary and sufficient condition that the Differential equation $Mdx + Ndy = 0$ is exact is

A : $\frac{\partial M}{\partial y}=\frac{\partial N}{\partial x}$

B : $\frac{\partial M}{\partial x}=\frac{\partial N}{\partial y}$

C : $\frac{\partial M}{\partial y}\neq\frac{\partial N}{\partial x}$

D : $\frac{\partial M}{\partial x}=\frac{\partial N}{\partial x}$

Q.no 8. The value of λ for which the differential equation $(xy^2+\lambda x^2y)dx + (x+y)x^2dy = 0$ is exact

A : 2

B : -3

C : 3

D : -2

Q.no 9.

Find semi-vertical angle for a right circular cone with vertex at the point $(1,0,1)$ which passes through the point $(1,1,1)$ and axis of cone has direction ratios $1,1,1$

A : $\sin\alpha = \dfrac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\,\sqrt{a_2^2 + b_2^2 + c_2^2}}$

B : $\cos\alpha = \dfrac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\,\sqrt{a_2^2 + b_2^2 + c_2^2}}$

C : $\cos\alpha = a_1a_2 + b_1b_2 + c_1c_2$

D : $\sin\alpha = a_1a_2 + b_1b_2 + c_1c_2$

Q.no 10. The formula to find the length of the curve $r = f(\theta)$ from $\theta = \theta_1$ to $\theta = \theta_2$ is

A : $\displaystyle\int_{\theta_1}^{\theta_2} \sqrt{1 + \left(\frac{dr}{d\theta}\right)^2}\, d\theta$

B : $\displaystyle\int_{\theta_1}^{\theta_2} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\, d\theta$

C : $\displaystyle\int_{\theta_1}^{\theta_2} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\, dr$

D : $\displaystyle\int_{\theta_2}^{\theta_1} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\, d\theta$

Q.no 11. If $\phi(a) = \int_0^\infty e^{-bx^2}\cos(2ax)\,dx,\ b > 0$ then by DUIS rule $\dfrac{d\phi}{da}$ is

A : $\displaystyle\int_0^\infty \frac{\partial}{\partial b}\left[e^{-bx^2}\cos(2ax)\right]dx$

B : $e^{-bx^2}\cos(2ax)$

C : $\int_0^\infty \frac{\partial}{\partial x}\left[e^{-bx^2}\cos(2ax)\right]dx$

D : $\int_0^\infty \frac{\partial}{\partial a}\left[e^{-bx^2}\cos(2ax)\right]dx$

Q.no 12.

The formula to find the length of the curve $y = f(x)$ from $x = a$ to $x = b$ is $s =$

A : $\int_a^b \sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dx$

B : $\int_a^b \sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dy$

C : $\int_a^b \sqrt{a^2+\left(\frac{dy}{dx}\right)^2}\,dx$

D : $\int_a^b \sqrt{a^2+b^2\left(\frac{dy}{dx}\right)^2}\,dy$

Q.no 13. Moment of inertia of the lamina A about the y axis is equal to

A : $\int\int_A \rho x^2 dxdy$

B : $\int\int_A \rho y^2 dxdy$

C : $\int\int_A \rho(x^2+y^2) dxdy$

D : $\int\int_A \rho x^2 y^2 dxdy$

Q.no 14. Which of the following is true?

A : $erf(x) - erfc(x) = 1$

B : $erf(x) + erfc(x) = 1$

C : $erf(x) + erfc(x) = 2$

D : $erf(-x) = erf(x)$

Q.no 15.

Find semi-vertical angle for a right circular cone with vertex at the point $(1,0,1)$ which passes through the point $(1,1,1)$ and axis of cone has direction ratios $1,1,1$

A : $\alpha = \cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

B : $\alpha = \cos^{-1} 1$

C : $\alpha = \sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

D : $\alpha = \cos^{-1}(\sqrt{3})$

Q.no 16.

The equation of tangent to the curve at origin represented by the equation $y(1+x^2) = x$ is

A : y=x

B : x=0

C : x=1

D : y=0

Q.no 17.

A particle moving in straight line with acceleration $k(x + \frac{a^4}{x^3})$ directed towards origin. The equation of motion is

A : $\frac{dv}{dx} = -k(x + \frac{a^4}{x^3})$

B : $v\dfrac{dv}{dx} = k(x + \dfrac{a^4}{x^3})$

C : $v\dfrac{dv}{dx} = -k(x + \dfrac{a^4}{x^3})$

D : $\dfrac{dv}{dx} = (x + \dfrac{a^4}{x^3})$

Q.no 18. Half range Fourier cosine series for $f(x)$ defined in the interval $0 \le x \le L$ is

A : Half range Fourier cosine series for $f(x)$ defined in the interval $0 \le x \le L$ is

B : $\dfrac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos\dfrac{nx}{L}$

C : $\dfrac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos\dfrac{n\pi x}{L}$

D : $\dfrac{a_0}{2} + \sum_{n=1}^{\infty} \left(a_n\, cos\dfrac{n\pi x}{L} + b_n \sin\dfrac{n\pi x}{L}\right)$

Q.no 19. The integrating factor of the DE $cosx\frac{dy}{dx} + ysinx = 1$ is

A : sec x

B : cot x

C : tan x

D : sin x

Q.no 20. Fourier law of heat conduction states that, the quantity of heat flow across an area A cm2 is

A : proportional to product of area A and temperature gradient dT/dx

B : inversely proportional to product of area A and temperature gradient dT/dx

C : equal to sum of area A and temperature gradient

D : equal to difference of area A and temperature gradient dT/dx

Q.no 21. The amount of heat Q flowing through the area per unit time is

A : Q = thermal conductivity x Area x Rate of change of temp. across an area

B : Q = thermal conductivity x Area of slab

C : Q = thermal conductivity x Area x temp. gradient

D : Q = thermal conductivity x Area + Rate of flow of heat

Q.no 22. $\int_0^{\pi/2} sin^p\theta cos^q\theta \, d\theta$ is equal to

A : $B\left(\frac{p-1}{2},\frac{q-1}{2}\right)$

B : $\frac{1}{2}B\left(\frac{p+1}{2},\frac{q+1}{2}\right)$

C : $B\left(\frac{p+1}{2},\frac{q+1}{2}\right)$

D : $B(p,q)$

Q.no 23. The curve $xy^2 = a^2(a-x)$

A : passes through the point (-a,0)

B : does not pass through origin

C : passes through the origin

D : passes through the point (a,a)

Q.no 24. If n is a positive integer, then $\Gamma(n+1)$ is

A : (n+1)!

B : (n+2)!

C : (n-1)!

D : n!

Q.no 25. If the differential equation $M(x,y)dx + N(x,y)dy = 0$ is not exact and it can be written as $yf_1(x,y)dx + xf_2(x,y)dy = 0$ then integrating factor is

A : $\frac{1}{My + Nx}; My + Nx \neq 0$

B : $\frac{1}{Mx + Ny}; Mx + Ny \neq 0$

C : $\frac{1}{Mx - Ny}; Mx - Ny \neq 0$

D : $\frac{1}{My - Nx}; My - Nx \neq 0$

Q.no 26. Error function of x, $erf(x)$ is defined as

A : $\frac{2}{\sqrt{\pi}} \int_0^x e^{-u^2} du$

B : $\frac{2}{\sqrt{\pi}} \int_x^\infty e^{-u^2} du$

C : $\int_0^\infty e^{-x} x^{n-1} dx$

D : $\frac{2}{\sqrt{\pi}} \int_0^\infty e^{-u^2} du$

Q.no 27. $erf(x) - erfc(x) = 1$ $erfc(x) = ?$

A : $\frac{2}{\sqrt{\pi}} \int_0^x e^{-u^2} du$

B : $\frac{2}{\sqrt{\pi}}\int_{x}^{\infty} e^{-u^2}\,du$

C : $\frac{2}{\sqrt{\pi}}\int_{0}^{x^2} e^{-t}t^{-1/2}dt$

D : 0

Q.no 28. Rectilinear motion is a motion of body along a

A : Straight line

B : Circular path

C : Parabolic path

D : Hyperbolic path

Q.no 29. Moment of inertia of the lamina A about the x axis is equal to

A : $\int\int_A \rho x^2 dxdy$

B : $\int\int_A \rho y^2 dxdy$

C : $\int\int_A \rho(x^2+y^2)dxdy$

D : $\int\int_A \rho x^2 y^2 dxdy$

Q.no 30. The value of $\int\int\int_V dxdydz$ where V is the volume bounded by $x^2+y^2+z^2=1$

A : $\frac{4}{3}\pi$

B : 4π

C : π

D : $\frac{1}{3}\pi$

Q.no 31. A circuit containing inductance L capacitance C in series with applied electromotive force E. By Kirchhoff's voltage law differential equation for current i is

A : $L\frac{di}{dt} + Ri = E$

B : $L\frac{di}{dt} + Ri = 0$

C : $L\frac{di}{dt} + \frac{q}{C} = E$

D : $L\frac{di}{dt} + \frac{q}{C} = 0$

Q.no 32. The integrating factor of the DE $\frac{dy}{dx} + y\cos x = \frac{\sin 2x}{2}$ is

A : $e^{\cos x}$

B : $e^{\sin x}$

C : sin x

D : cos x

Q.no 33. If $I(\alpha) = \int_a^b f(x,\alpha)\,dx$ where α is parameter and a, b are constants then by DUIS rule $\frac{dI(\alpha)}{d\alpha}$ is

A : $\int_a^b \frac{\partial}{\partial \alpha} f(x,\alpha)dx$

B : $\int_a^b \frac{\partial}{\partial x} f(x,\alpha)dx$

C : $f(b, \alpha) - f(a, \alpha)$

D : $f(x, \alpha)$

Q.no 34. For RC circuit the charge q satisfies the linear D.E.

A : $R + \frac{dq}{dt} = E$

B : $Ri + q = 0$

C : $A = \frac{1}{3}\pi r^2 l$

D : $R\frac{dq}{dt} + \frac{q}{C} = E$

Q.no 35. The integrating factor of $(3x^2y^4 + 2xy)dx + (2x^3y^3 - x^2)dy = 0$ using non exact rule $\frac{\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)}{M}$ is

A : y^2

B : $\frac{1}{y^2}$

C : y

D : 1/y

Q.no 36. The integrating factor for the DE $\frac{dy}{dx} + \frac{x}{1+x}y = 1 + x$ is

A : $e^{x(1+x)}$

B : $e^{x(1+x)}$

C : $e^{x/(1+x)}$

D : $1 + x^2$

Q.no 37. The solution of the DE $\frac{dy}{dx} = \frac{x^2}{y^3}$ is

A : $y^3 - x^3 = c$

B : $3y^4 - 4x^3 = c$

C : $y^2 - x^3 = c$

D : $x^2 - y^2 = c$

Q.no 38. If double integral in Cartesian coordinate is given by $\int\int_R f(x, y)\, dxdy$ then the value of same integral in polar form is

A : $\int\int_R f(r\cos\theta, r\sin\theta)\, r dr d\theta$

B : $\int\int_R f(r\cos\theta, r\sin\theta)\, r dr d\theta$

C : $\int\int_R f(r\cos\theta, r\sin\theta)\, r^2 dr d\theta$

D : $\int\int_R f(r\sin\theta, r\cos\theta)\, r dr d\theta$

Q.no 39.

Equation of right circular cylinder whose radius is 'r' and axis is the line $\frac{x}{l} = \frac{y}{m} = \frac{z}{n}$ is

A : $x^2 + y^2 + z^2 = r^2 + \left(\frac{lx + my + nz}{\sqrt{l^2 + m^2 + n^2}}\right)^2$

B : $\alpha = \cos^{-1} 1$

C : $x^2 + y^2 + z^2 = r^2 + \frac{lx + my + nz}{\sqrt{l^2 + m^2 + n^2}}$

D : $(x + y + z) = r^2 + \left(\frac{lx + my + nz}{\sqrt{l^2 + m^2 + n^2}}\right)^2$

Q.no 40. Voltage drop across inductance L is given by

A : Li

B : L di/dt

C : dL/dt

D : L dL/dt

Q.no 41. According to D'Alembert's principle algebraic sum of forces acting on a body along a given direction is equal to

A : Velocity x Acceleration

B : Mass x Velocity

C : Mass x displacement

D : Mass x Acceleration

Q.no 42. If q be the quantity of heat that flows across an area A cm2 and thickness δx in one second where the difference of temperature at the faces is δT, then by Fourier's law of heat conduction

A : $q = -k\left(A - \frac{dt}{dx}\right)$, where k is thermal conductivity

B : $q = kA\frac{dT}{dx}$, where k is thermal conductivity

C : $q = -k\left(A + \frac{dt}{dx}\right)$, where k is thermal conductivity

D : $q = -kA\frac{dT}{dx}$, , where k is thermal conductivity

Q.no 43. q56.jpg

A : 1

B : 0

C : q56_3.jpg

D : q56_4.jpg

Q.no 44. Radius of right circular cylinder is 2 and direction ratios 2,-1,5 and fixed point on axis of the line (1,-3,2)then the equation of right circular cylinder is

A : $(x+1)^2 + (y+3)^2 + (z-2)^2 = 2^2 + \left(\frac{2x - y + 5z - 15}{\sqrt{30}}\right)^2$

B : $(x+1)^2 + (y+3)^2 + (z-2)^2 = 2^2 + \left(\frac{2x - y + 5z - 15}{\sqrt{30}}\right)^2$

C : $(x-1)^2 + (y+3)^2 - (z-2)^2 = 2^2 + \left(\frac{2x - y - 5z - 15}{\sqrt{30}}\right)^2$

D : $(x-1)^2 + (y+3)^2 + (z-2)^2 = 2^2 + \left(\frac{2x - y + 5z - 15}{\sqrt{30}}\right)^2$

Q.no 45.

The value of integration $\int_0^1 \int_0^x (x^2 + y^2)\, dx dy$ is equal to

A : 4/3

B : 5/3

C : 2/3

D : 1

Q.no 46. B(4,5)=

A : 1/280

B : 4/105

C : 1/70

D : 1/210

Q.no 47.

The radius of the circle of intersection of the sphere $x^2 + y^2 + z^2 - 2x + 4y + 2z - 6 = 0$ by the plane $x + 2y + 2z - 4 = 0$ is:

[Centre of the circle is(2,0,1)]

A : 9

B : 3

C : 12

D : $\sqrt{3}$

Q.no 48. The value of $erf(0)+erf(\infty)$ is

A : 1

B : -1

C : 0

D : ∞

Q.no 49.

Axis of the right circular cylinder is $\frac{x-1}{2}=\frac{y+3}{-1}=\frac{z-2}{5}$ what are direction cosines of axis

A : $\alpha=\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

B : $\left(\frac{2}{\sqrt{30}},\frac{-1}{\sqrt{30}},\frac{5}{\sqrt{30}}\right)$

C : $\left(\frac{-2}{\sqrt{30}},\frac{1}{\sqrt{30}},\frac{-5}{\sqrt{30}}\right)$

D : $\left(\frac{2}{\sqrt{30}},\frac{1}{\sqrt{30}},\frac{5}{\sqrt{30}}\right)$

Q.no 50.

The equation of sphere which passes through the point (4, 6, 3) and passes through the circle $(x-1)^2+(y-2)^2=25,\ z=0$ is

A : $x^2+y^2+z^2-2x-4y-3z-20=0$

B : $x^2+y^2+z^2+3x-4y+3z-16=0$

C : $2x^2+2y^2+2z^2+6x-3y+2z=0$

D : $x^2+y^2+z^2+4x-4y+3z-20=0$

Q.no 51.

If the plane $4x - 3y + 6z - 35 = 0$ is tangential to the sphere

$x^2 + y^2 + z^2 - y - 2z - 14 = 0$ then the length of perpendicular from any point P on the plane is---

A : $\frac{61}{2}$

B : $\frac{61}{2}$

C : 30

D : $-\frac{\sqrt{61}}{2}$

Q.no 52. Radius of right circular cylinder is 5and whose axis is the line $\frac{x-2}{3} = \frac{y-3}{1} = \frac{z+1}{1}$ Then the equation of right circular cylinder is

A : $(x+2)^2 + (y+3)^2 + (z+1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

B : $(x-2)^2 + (y-3)^2 + (z-1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

C : $(x+2)^2 + (y-3)^2 + (z+1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

D : $(x-2)^2 + (y-3)^2 + (z+1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

Q.no 53.

The two spheres $x^2 + y^2 + z^2 - 12x - 18y - 24z + 29 = 0$ and $x^2 + y^2 + z^2 + 3x - 3y + 3z - 56 = 0$

A : touches each other internally

B : touches each other externally

C : touches each other Orthogonally

D : Intersecting each other

Q.no 54. A particle of mass m moves in a horizontal straight line OA with acceleration $\frac{k}{x^3}$ at a distance x and directed towards origin O. Then the differential equation of motion is

A : $v\frac{dv}{dx} = \frac{k}{x^3}$

B : $v\frac{dv}{dx} = -\frac{k}{x^3}$

C : $\frac{dv}{dx} = -\frac{k}{x^3}$

D : $\frac{dv}{dx} = \frac{k}{x^3}$

Q.no 55. The value of integration $\int_0^1 \int_x^{\sqrt{x}} xydxdy$ is equal to

A : 0

B : -1/24

C : 1/24

D : 24

Q.no 56. The solution of the DE $\frac{dy}{dx} + y = e^{-x}$ is

A : $ye^{-x} + c = x$

B : $ye^{x} + x = c$

C : $ye^{x} = x + c$

D : $y = x + c$

Q.no 57. If $I_n = \int_0^{\pi/2} cos^n x\, dx$then which of the following relation is true?

A : $\frac{n-1}{n} \cdot \frac{n-3}{n-2.} \cdot \frac{n-5}{n-4} \dots \dots \frac{3}{4} \cdot \frac{1}{2}$

B : $I_n = \frac{n}{n-1} I_{n-2}$

C : $I_n = \frac{n-1}{n} I_{n-2}$

D : $I_n = n(n+1)\, I_{n-1}$

Q.no 58. $\frac{5\pi}{128}$

A : $\frac{5\pi}{128}$

B : $\frac{3\pi}{128}$

C : $\frac{3\pi}{512}$

D : $\frac{5\pi}{64}$

Q.no 59. The value of a_0 in harmonic analysis of y for the following tabulated data is

x	0	1	2	3	4	5	6
y	9	18	24	28	26	20	9

A : 17.85

B : 20.83

C : 35.71

D : 41.66

Q.no 60. The value of integration $\int_0^2 \int_0^{x^2} e^{\frac{y}{x}} dxdy$ is equal to

A : $e^2 - 2$

B : $2e^2 - 1$

C : $e^2 - 1$

D : $e^2 + 1$

Answer for Question No 1. is c

Answer for Question No 2. is b

Answer for Question No 3. is c

Answer for Question No 4. is a

Answer for Question No 5. is c

Answer for Question No 6. is a

Answer for Question No 7. is a

Answer for Question No 8. is c

Answer for Question No 9. is b

Answer for Question No 10. is b

Answer for Question No 11. is d

Answer for Question No 12. is a

Answer for Question No 13. is a

Answer for Question No 14. is b

Answer for Question No 15. is a

Answer for Question No 16. is a

Answer for Question No 17. is c

Answer for Question No 18. is c

Answer for Question No 19. is a

Answer for Question No 20. is a

Answer for Question No 21. is c

Answer for Question No 22. is b

Answer for Question No 23. is b

Answer for Question No 24. is d

Answer for Question No 25. is c

Answer for Question No 26. is a

Answer for Question No 27. is b

Answer for Question No 28. is a

Answer for Question No 29. is b

Answer for Question No 30. is a

Answer for Question No 31. is c

Answer for Question No 32. is b

Answer for Question No 33. is a

Answer for Question No 34. is d

Answer for Question No 35. is b

Answer for Question No 36. is c

Answer for Question No 37. is b

Answer for Question No 38. is a

Answer for Question No 39. is a

Answer for Question No 40. is b

Answer for Question No 41. is d

Answer for Question No 42. is d

Answer for Question No 43. is c

Answer for Question No 44. is d

Answer for Question No 45. is c

Answer for Question No 46. is a

Answer for Question No 47. is d

Answer for Question No 48. is a

Answer for Question No 49. is b

Answer for Question No 50. is a

Answer for Question No 51. is a

Answer for Question No 52. is d

Answer for Question No 53. is c

Answer for Question No 54. is b

Answer for Question No 55. is c

Answer for Question No 56. is c

Answer for Question No 57. is c

Answer for Question No 58. is b

Answer for Question No 59. is d

Answer for Question No 60. is c

Seat No -

Total number of questions : 60

1000505 T1 ENGINEERING MATHEMATICS II

Time : 1hr

Max Marks : 50

N.B

1) All questions are Multiple Choice Questions having single correct option.

2) Attempt any 50 questions out of 60.

3) Use of calculator is allowed.

4) Each question carries 1 Mark.

5) Specially abled students are allowed 20 minutes extra for examination.

6) Do not use pencils to darken answer.

7) Use only black/blue ball point pen to darken the appropriate circle.

8) No change will be allowed once the answer is marked on OMR Sheet.

9) Rough work shall not be done on OMR sheet or on question paper.

10) Darken ONLY ONE CIRCLE for each answer.

Q.no 1. According to D'Alembert's principle algebraic sum of forces acting on a body along a given direction is equal to

A : Velocity x Acceleration

B : Mass x Velocity

C : Mass x displacement

D : Mass x Acceleration

Q.no 2. The amount of heat Q flowing through the area per unit time is

A : Q = thermal conductivity x Area x Rate of change of temp. across an area

B : Q = thermal conductivity x Area of slab

C : Q = thermal conductivity x Area x temp. gradient

D : Q = thermal conductivity x Area + Rate of flow of heat

Q.no 3. Half range Fourier cosine series for $f(x)$ defined in the interval $0 \le x \le L$ is

A : Half range Fourier cosine series for $f(x)$ defined in the interval $0 \le x \le L$ is

B : $\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos \frac{nx}{L}$

C : $\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos \frac{n\pi x}{L}$

D : $\frac{a_0}{2} + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$

Q.no 4. A pipe contains steam and is protected with a covering then in the formula $q = kA\,\frac{dT}{dt}$

A : $A = 2\pi r l$

B : $A = \frac{1}{3}\pi r^2 l$

C : $A = \frac{1}{3}\pi r^2 l$

D : $A = rl$

Q.no 5. B(m,n) is equal to

A : $\int_0^1 x^{m-1}(1-x)^{n-1}dx$

B : $\int_0^\infty x^{m-1}(1-x)^{n-1}dx$

C : $\int_0^1 x^m(1-x)^n dx$

D : $\int_0^1 e^{-x}x^{n-1}dx$

Q.no 6. The formula to find the length of the curve $r = f(\theta)$ from $\theta = \theta_1$ to $\theta = \theta_2$ is

A : $\int_{\theta_1}^{\theta_2} \sqrt{1 + \left(\frac{dr}{d\theta}\right)^2}\, d\theta$

B : $\int_{\theta_1}^{\theta_2} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\, d\theta$

C : $\int_{\theta_1}^{\theta_2} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\, dr$

D : $\int_{\theta_2}^{\theta_1} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\, d\theta$

Q.no 7. If the DE $Mdx + Ndy = 0$ can be written as $x^a y^b(mydx + nxdy) + x^r y^s(pydx + qxdy) = 0$ then integrating factor is

A : $x^h y^k$

B : x^h

C : xy

D : $\frac{1}{x^h y^k}$

Q.no 8. The value of λ for which the differential equation $(xy^2 + \lambda x^2 y)dx + (x + y)x^2 dy = 0$ is exact

A : 2

B : -3

C : 3

D : -2

Q.no 9. A circuit containing inductance L capacitance C in series with applied electromotive force E. By Kirchhoff's voltage law differential equation for current i is

A : $L\frac{di}{dt} + Ri = E$

B : $L\frac{di}{dt} + Ri = 0$

C : $L\frac{di}{dt} + \frac{q}{C} = E$

D : $L\frac{di}{dt} + \frac{q}{C} = 0$

Q.no 10.

The formula to find the length of the curve $y = f(x)$ from $x = a$ to $x = b$ is $s =$

A : $\int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dx$

B : $\int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dy$

C : $\int_a^b \sqrt{a^2 + \left(\frac{dy}{dx}\right)^2}\, dx$

D : $\int_a^b \sqrt{a^2 + b^2\left(\frac{dy}{dx}\right)^2}\, dy$

Q.no 11. The differential equation for the current in an electric circuit containing resistance R and inductance L in series with voltage source E sin(wt) is

A : $L\frac{di}{dt} + \frac{q}{C} = E$

B : $Li + R\dfrac{di}{dt} = Esin\omega t$

C : $L\dfrac{di}{dt} + Ri = 0$

D : $L\dfrac{di}{dt} + Ri = 0$

Q.no 12.

Find semi-vertical angle for a right circular cone with vertex at the point $(1,0,1)$ which passes through the point $(1,1,1)$ and axis of cone has direction ratios $1,1,1$

A : $\alpha = \cos^{-1}\left(\dfrac{1}{\sqrt{3}}\right)$

B : $\alpha = \cos^{-1} 1$

C : $\alpha = \sin^{-1}\left(\dfrac{1}{\sqrt{3}}\right)$

D : $\alpha = \cos^{-1}(\sqrt{3})$

Q.no 13. For RC circuit the charge q satisfies the linear D.E.

A : $R + \dfrac{dq}{dt} = E$

B : $Ri + q = 0$

C : $A = \frac{1}{3}\pi r^2 l$

D : $R\dfrac{dq}{dt} + \dfrac{q}{C} = E$

Q.no 14. The value of integration $\int_0^a \int_0^b \int_0^c x^2y^2z^2 dxdydz$ is equal to

A : $\frac{abc}{3}$

B : $\frac{a^2b^2c^2}{3}$

C : $\frac{a^3b^3c^3}{27}$

D : $\frac{a^2b^2c^2}{9}$

Q.no 15. If double integral in Cartesian coordinate is given by $\int\int_R f(x,y)\,dxdy$ then the value of same integral in polar form is

A : $\int\int_R f(r\cos\theta, r\sin\theta)\,rdrd\theta$

B : $\int\int_R f(r\cos\theta, r\sin\theta)\,rdrd\theta$

C : $\int\int_R f(r\cos\theta, r\sin\theta)\,r^2drd\theta$

D : $\int\int_R f(r\sin\theta, r\cos\theta)\,rdrd\theta$

Q.no 16. The integrating factor for the DE $(1+x^2)\frac{dy}{dx}+xy=0$ is

A : e^{1+x^2}

B : $\log(x^2+1)$

C : $\sqrt{x^2+1}$

D : $1+x^2$

Q.no 17. If n is a positive integer, then $\Gamma(n+1)$ is

A : (n+1)!

B : (n+2)!

C : (n-1)!

D : n!

Q.no 18. The integrating factor of the DE $cosx\frac{dy}{dx} + ysinx = 1$ is

A : sec x

B : cot x

C : tan x

D : sin x

Q.no 19. The value of $\int\int\int_V dxdydz$ where V is the volume bounded by $x^2 + y^2 + z^2 = 1$

A : $\frac{4}{3}\pi$

B : 4π

C : π

D : $\frac{1}{3}\pi$

Q.no 20. If the equation of curve remains unchanged by replacing y by -y, then the curve is symmetric about

A : y-axis

B : line y=x

C : x-axis

D : line y=-x

Q.no 21. If the differential equation $M(x,y)dx + N(x,y)dy = 0$ is not exact and it can be written as $yf_1(x,y)dx + xf_2(x,y)dy = 0$ then integrating factor is

A : $\frac{1}{My + Nx}; My + Nx \neq 0$

B : $\frac{1}{Mx + Ny}; Mx + Ny \neq 0$

C : $\frac{1}{Mx - Ny}$; $Mx - Ny \neq 0$

D : $\frac{1}{My - Nx}$; $My - Nx \neq 0$

Q.no 22. Area enclosed by the polar curve $r = f_1(\theta)$ and $r = f_2(\theta)$ and the line $\theta = \alpha, \theta = \beta \alpha < \beta$ is given by

A : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} r dr d\theta$

B : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} dr d\theta$

C : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} r^2 \sin\theta dr d\theta$

D : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} r^2 \cos\theta dr d\theta$

Q.no 23.
Find semi-vertical angle for a right circular cone with vertex at the point (1,0,1)which passes through the point (1,1,1) and axis of cone has direction ratios 1,1,1

A : $\sin\alpha = \frac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\sqrt{a_2^2 + b_2^2 + c_2^2}}$

B : $\cos\alpha = \frac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\sqrt{a_2^2 + b_2^2 + c_2^2}}$

C : $\cos\alpha = a_1a_2 + b_1b_2 + c_1c_2$

D : $\sin\alpha = a_1a_2 + b_1b_2 + c_1c_2$

Q.no 24. The integrating factor of the DE $\frac{dx}{dy} + \frac{3}{y}x = \frac{1}{y^2}$

A : $-y^3$

B : y^3

C : x^2y

D : x^3

Q.no 25. A particle moving in straight line with acceleration $k(x+\frac{a^4}{x^3})$ directed towards origin. The equation of motion is

A : $\frac{dv}{dx}=-k(x+\frac{a^4}{x^3})$

B : $v\frac{dv}{dx}=k(x+\frac{a^4}{x^3})$

C : $v\frac{dv}{dx}=-k(x+\frac{a^4}{x^3})$

D : $\frac{dv}{dx}=(x+\frac{a^4}{x^3})$

Q.no 26. The differential equation for the current i in an electric circuit containing resistance R=250 ohm and an inductance of L=640 henery in series with an electromotive force E=500 volts is

A : $640\frac{di}{dt}+250i=0$

B : $250\frac{di}{dt}+640i=500$

C : $640\frac{di}{dt}+250i=500$

D : $250\frac{di}{dt}+640i=0$

Q.no 27. Rectilinear motion is a motion of body along a

A : Straight line

B : Circular path

C : Parabolic path

D : Hyperbolic path

Q.no 28. The integrating factor of the DE $\frac{dy}{dx} + ycosx = \frac{sin2x}{2}$ is

A : e^{cosx}

B : e^{sinx}

C : sin x

D : cos x

Q.no 29. To change Cartesian coordinates (x, y, z) to spherical polar coordinate (r, θ, ϕ);$dxdydz$ is replaced by

A : To change Cartesian coordinates (x, y, z) to spherical polar coordinate (r, θ, ϕ);$dxdydz$ is replaced by

B : $r^2 \cos\theta dr d\theta d\phi$

C : $r^2 dr d\theta d\phi$

D : $r dr d\theta d\phi$

Q.no 30. If $I(\alpha) = \int_a^b f(x, \alpha)dx$ where α is parameter and a, b are constants then by DUIS rule $\frac{dI(\alpha)}{d\alpha}$ is

A : $\int_a^b \frac{\partial}{\partial \alpha} f(x,\alpha)dx$

B : $\int_a^b \frac{\partial}{\partial x} f(x,\alpha)dx$

C : $f(b, \alpha) - f(a, \alpha)$

D : $f(x, \alpha)$

Q.no 31. Fourier law of heat conduction states that, the quantity of heat flow across an area A cm2 is

A : proportional to product of area A and temperature gradient dT/dx

B : inversely proportional to product of area A and temperature gradient dT/dx

C : equal to sum of area A and temperature gradient

D : equal to difference of area A and temperature gradient dT/dx

Q.no 32. The necessary and sufficient condition that the Differential equation $Mdx + Ndy = 0$ is exact is

A : $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$

B : $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$

C : $\frac{\partial M}{\partial y} \neq \frac{\partial N}{\partial x}$

D : $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial x}$

Q.no 33. Moment of inertia of the lamina A about the y axis is equal to

A : $\int \int_A \rho x^2 dxdy$

B : $\int \int_A \rho y^2 dxdy$

C : $\int \int_A \rho(x^2 + y^2) dxdy$

D : $\int \int_A \rho x^2 y^2 dxdy$

Q.no 34. If $\phi(a)=\int_0^{\infty} e^{-bx^2}\cos(2ax)\,dx,\ b>0$ then by DUIS rule $\dfrac{d\phi}{da}$ is

A : $\int_0^{\infty} \frac{\partial}{\partial b}\left[e^{-bx^2}\cos(2ax)\right]dx$

B : $e^{-bx^2}\cos(2ax)$

C : $\int_0^{\infty} \frac{\partial}{\partial x}\left[e^{-bx^2}\cos(2ax)\right]dx$

D : $\int_0^{\infty} \frac{\partial}{\partial a}\left[e^{-bx^2}\cos(2ax)\right]dx$

Q.no 35. $erf(x)-erfc(x)=1 \quad erfc(x)=?$

A : $\frac{2}{\sqrt{\pi}}\int_0^{x} e^{-u^2}\,du$

B : $\frac{2}{\sqrt{\pi}}\int_x^{\infty} e^{-u^2}\,du$

C : $\frac{2}{\sqrt{\pi}}\int_0^{x^2} e^{-t}t^{-1/2}\,dt$

D : 0

Q.no 36. The integrating factor of $(x^2+y^2+x)dx+xydy=0$ using non exact rule $\frac{\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)}{N}$ is

A : x

B : 1/x

C : x2

D : xy

Q.no 37. $\int_0^{\pi/2} sin^p\theta cos^q\theta \, d\theta$ is equal to

A : $B\left(\frac{p-1}{2}, \frac{q-1}{2}\right)$

B : $\frac{1}{2}B\left(\frac{p+1}{2}, \frac{q+1}{2}\right)$

C : $B\left(\frac{p+1}{2}, \frac{q+1}{2}\right)$

D : $B(p,q)$

Q.no 38.

Condition for the two spheres $x^2 + y^2 + z^2 + 2u_1x + 2v_1y + 2w_1z + d_1 = 0$ and $x^2 + y^2 + z^2 + 2u_2x + 2v_2y + 2w_2z + d_2 = 0$ to be orthogonal is ---

A : $S + \lambda U = 0$

B : $S_1 - S_2 = 0$

C : $2u_1u_2 + 2v_1v_2 + 2w_1w_2 = d_1 + d_2$

D : $u_1u_2 + v_1v_2 + w_1w_2 = d_1 + d_2$

Q.no 39. The integrating factor of $(3x^2y^4 + 2xy)dx + (2x^3y^3 - x^2)dy = 0$ using non exact rule $\frac{\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)}{M}$ is

A : y^2

B : $\frac{1}{y^2}$

C : y

D : 1/y

Q.no 40.

The equation of tangent to the curve at origin represented by the equation $y(1+x^2) = x$ is

A : y=x

B : x=0

C : x=1

D : y=0

Q.no 41. Error function of x, $erf(x)$ is defined as

A : $\frac{2}{\sqrt{\pi}}\int_0^x e^{-u^2}\,du$

B : $\frac{2}{\sqrt{\pi}}\int_x^\infty e^{-u^2}\,du$

C : $\int_0^\infty e^{-x}x^{n-1}\,dx$

D : $\frac{2}{\sqrt{\pi}}\int_0^\infty e^{-u^2}\,du$

Q.no 42. The value of the integral $\int_0^b e^{-u^2}\,du$ is

A : $\frac{2}{\sqrt{\pi}}\int_0^x e^{-u^2}\,du$

B : $\frac{\sqrt{\pi}}{2} erf\,(b)$

C : $\frac{2}{\sqrt{\pi}} erf_C(b)$

D : $erf\,(b)$

Q.no 43. The solution of the DE $\frac{dy}{dx} + y = e^{-x}$ is

A : $ye^{-x} + c = x$

B : $ye^{x} + x = c$

C : $ye^{x} = x + c$

D : $y = x + c$

Q.no 44. q56.jpg

A : 1

B : 0

C : q56_3.jpg

D : q56_4.jpg

Q.no 45. A capacitor C=0.01 farad in series with resistor R=20 ohms is charged from battery E=10 volts. If initially capacitor is completely discharged then differential equation for charge q(t) is given by

A : $20\frac{dq}{dt} + \frac{q}{0.01} = 0 \ ; \ q(0) = 0$

B : $20\frac{dq}{dt} + 0.01q = 10 \ ; \ q(0) = 0$

C : $20\frac{dq}{dt} + \frac{q}{0.01} = 10 \ ; \ q(0) = 0$

D : $20\frac{dq}{dt} + 0.01q = 0 \ ; \ q(0) = 0$

Q.no 46. The value of integration $\int_0^1 \int_x^{\sqrt{x}} xydxdy$ is equal to

A : 0

B : -1/24

C : 1/24

D : 24

Q.no 47. The value of integration $\int_0^1 \int_0^{x^2} xe^y dxdy$ is equal to

A : e/2

B : e-1

C : 1-e

D : (e/2)-1

Q.no 48. If $I(\alpha) = \int_0^1 \frac{x^\alpha - 1}{\log x} dx$, $\alpha \geq 0$ then by DUIS $\frac{dI}{d\alpha}$ is

A : $\int_0^1 \log x \, dx$

B : $\int_0^1 x^\alpha \log x \, dx$

C : $\int_0^1 x^\alpha dx$

D : $\int_0^1 x^{-\alpha} dx$

Q.no 49. If $I(\alpha) = \int_0^1 \frac{x^\alpha - 1}{\log x} dx$, $\alpha \geq 0$ then by DUIS $\frac{dI}{d\alpha}$ is

A : $\log(\alpha + 1)$

B : $\log(\alpha - 1)$

C : $\log \alpha$

D : 0

Q.no 50.

Find the equation of right circular cone whose vertex is at origin, whose axis is the line $\frac{x}{2} = \frac{y}{-1} = \frac{z}{2}$ and semi-vertical angle $\frac{\pi}{4}$

A : $3(x^2 + y^2 + z^2) = 4\,(2x - y + 2z)^2$

B : $9(x^2 + y^2 + z^2) = 2\,(2x - y + 2z)^2$

C : $6(x^2 + y^2 + z^2) = 2\,(2x - y + 2z)^2$

D : $(x^2 + y^2 + z^2) = (2x - y + 2z)^2$

Q.no 51. In spherical co-ordinates volume is given by

A : $V = \int\int\int_V dr d\theta d\phi$

B : $V = \int\int\int_V r dr d\theta d\phi$

C : $V = \int\int\int_V r^2 \cos\theta dr d\theta d\phi$

D : $V = \int\int\int_V r^2 \sin\theta dr d\theta d\phi$

Q.no 52.

The value of integration $\int_0^1 \int_0^x (x^2 + y^2)\, dx dy$ is equal to

A : 4/3

B : 5/3

C : 2/3

D : 1

Q.no 53.

If $I(\alpha)=\int_a^b f(x,\alpha)\,dx$ where a, b are function of parameter α then by DUIS rule $\frac{dI(\alpha)}{d\alpha}$ is

A : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx+f(a,\alpha)\frac{da}{d\alpha}-f(b,\alpha)\frac{db}{d\alpha}$

B : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx+f(b,\alpha)\frac{db}{d\alpha}-f(a,\alpha)\frac{da}{d\alpha}$

C : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx+f(b,\alpha)\frac{db}{d\alpha}-f(a,\alpha)\frac{da}{d\alpha}$

D : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx$

Q.no 54.

A particle of mass m moves in a horizontal straight line OA with acceleration $\frac{k}{x^3}$ at a distance x and directed towards origin O. Then the differential equation of motion is

A : $v\frac{dv}{dx}=\frac{k}{x^3}$

B : $v\frac{dv}{dx}=-\frac{k}{x^3}$

C : $\frac{dv}{dx}=-\frac{k}{x^3}$

D : $\frac{dv}{dx}=\frac{k}{x^3}$

Q.no 55. B(4,5)=

A : 1/280

B : 4/105

C : 1/70

D : 1/210

Q.no 56. Radius of right circular cylinder is 2 and direction ratios 2,-1,5 and fixed point on axis of the line (1,-3,2)then the equation of right circular cylinder is

A : $(x+1)^2 + (y+3)^2 + (z-2)^2 = 2^2 + \left(\frac{2x-y+5z-15}{\sqrt{30}}\right)^2$

B : $(x+1)^2 + (y+3)^2 + (z-2)^2 = 2^2 + \left(\frac{2x-y+5z-15}{\sqrt{30}}\right)^2$

C : $(x-1)^2 + (y+3)^2 - (z-2)^2 = 2^2 + \left(\frac{2x-y-5z-15}{\sqrt{30}}\right)^2$

D : $(x-1)^2 + (y+3)^2 + (z-2)^2 = 2^2 + \left(\frac{2x-y+5z-15}{\sqrt{30}}\right)^2$

Q.no 57.

The value of integration $\int_0^1 \int_0^1 \int_0^1 xyzdxdydz$ is equal to

A : 0.125

B : 0.25

C : -0.125

D : 1

Q.no 58. The value of integration $\int_0^2 \int_0^{x^2} e^{\frac{y}{x}} dxdy$ is equal to

A : $e^2 - 2$

B : $2e^2 - 1$

C : $e^2 - 1$

D : $e^2 + 1$

Q.no 59. Fourier coefficient a_0 in the Fourier series expansion of

$f(x) = x \sin x \,;\, 0 \le x \le 2\pi$ and $f(x+2\pi) = f(x)$

A : 2

B : 0

C : -2

D : -4

Q.no 60. The value of a_0 in harmonic analysis of y for the following tabulated data is

x	0	1	2	3	4	5	6
y	9	18	24	28	26	20	9

A : 17.85

B : 20.83

C : 35.71

D : 41.66

Answer for Question No 1. is d

Answer for Question No 2. is c

Answer for Question No 3. is c

Answer for Question No 4. is a

Answer for Question No 5. is a

Answer for Question No 6. is b

Answer for Question No 7. is a

Answer for Question No 8. is c

Answer for Question No 9. is c

Answer for Question No 10. is a

Answer for Question No 11. is d

Answer for Question No 12. is a

Answer for Question No 13. is d

Answer for Question No 14. is c

Answer for Question No 15. is a

Answer for Question No 16. is b

Answer for Question No 17. is d

Answer for Question No 18. is a

Answer for Question No 19. is a

Answer for Question No 20. is c

Answer for Question No 21. is c

Answer for Question No 22. is a

Answer for Question No 23. is b

Answer for Question No 24. is b

Answer for Question No 25. is c

Answer for Question No 26. is c

Answer for Question No 27. is a

Answer for Question No 28. is b

Answer for Question No 29. is a

Answer for Question No 30. is a

Answer for Question No 31. is a

Answer for Question No 32. is a

Answer for Question No 33. is a

Answer for Question No 34. is d

Answer for Question No 35. is b

Answer for Question No 36. is a

Answer for Question No 37. is b

Answer for Question No 38. is c

Answer for Question No 39. is b

Answer for Question No 40. is a

Answer for Question No 41. is a

Answer for Question No 42. is b

Answer for Question No 43. is c

Answer for Question No 44. is c

Answer for Question No 45. is c

Answer for Question No 46. is c

Answer for Question No 47. is b

Answer for Question No 48. is c

Answer for Question No 49. is a

Answer for Question No 50. is b

Answer for Question No 51. is d

Answer for Question No 52. is c

Answer for Question No 53. is c

Answer for Question No 54. is b

Answer for Question No 55. is a

Answer for Question No 56. is d

Answer for Question No 57. is a

Answer for Question No 58. is c

Answer for Question No 59. is c

Answer for Question No 60. is d

Seat No -

Total number of questions : 60

1000505 T1 ENGINEERING MATHEMATICS II

Time : 1hr

Max Marks : 50

N.B

1) All questions are Multiple Choice Questions having single correct option.

2) Attempt any 50 questions out of 60.

3) Use of calculator is allowed.

4) Each question carries 1 Mark.

5) Specially abled students are allowed 20 minutes extra for examination.

6) Do not use pencils to darken answer.

7) Use only black/blue ball point pen to darken the appropriate circle.

8) No change will be allowed once the answer is marked on OMR Sheet.

9) Rough work shall not be done on OMR sheet or on question paper.

10) Darken ONLY ONE CIRCLE for each answer.

Q.no 1. $erf(x) - erfc(x) = 1 \quad erfc(x) = ?$

A : $\frac{2}{\sqrt{\pi}}\int_0^x e^{-u^2}\,du$

B : $\frac{2}{\sqrt{\pi}}\int_x^\infty e^{-u^2}\,du$

C : $\frac{2}{\sqrt{\pi}}\int_0^{x^2} e^{-t}t^{-1/2}\,dt$

D : 0

Q.no 2.

The equation of tangent to the curve at origin represented by the equation $y(1+x^2) = x$ is

A : y=x

B : x=0

C : x=1

D : y=0

Q.no 3. According to D'Alembert's principle algebraic sum of forces acting on a body along a given direction is equal to

A : Velocity x Acceleration

B : Mass x Velocity

C : Mass x displacement

D : Mass x Acceleration

Q.no 4. A particle moving in straight line with acceleration $k(x+\frac{a^4}{x^3})$ directed towards origin. The equation of motion is

A : $\frac{dv}{dx}=-k(x+\frac{a^4}{x^3})$

B : $v\frac{dv}{dx}=k(x+\frac{a^4}{x^3})$

C : $v\frac{dv}{dx}=-k(x+\frac{a^4}{x^3})$

D : $\frac{dv}{dx}=(x+\frac{a^4}{x^3})$

Q.no 5. If the DE $Mdx+Ndy=0$ can be written as $x^a y^b(mydx+nxdy)+x^r y^s(pydx+qxdy)=0$ then integrating factor is

A : $x^h y^k$

B : x^h

C : xy

D : $\frac{1}{x^h y^k}$

Q.no 6. The integrating factor for the DE $(1 + x^2)\frac{dy}{dx} + xy = 0$ is

A : e^{1+x^2}

B : $\log(x^2 + 1)$

C : $\sqrt{x^2 + 1}$

D : $1 + x^2$

Q.no 7. Voltage drop across inductance L is given by

A : Li

B : L di/dt

C : dL/dt

D : L dL/dt

Q.no 8. For RC circuit the charge q satisfies the linear D.E.

A : $R + \frac{dq}{dt} = E$

B : $Ri + q = 0$

C : $A = \frac{1}{3}\pi r^2 l$

D : $R\frac{dq}{dt} + \frac{q}{C} = E$

Q.no 9. The value of $\int\int\int_V dxdydz$ where V is the volume bounded by $x^2 + y^2 + z^2 = 1$

A : $\frac{4}{3}\pi$

B : 4π

C : π

D : $\frac{1}{3}\pi$

Q.no 10.

Find semi-vertical angle for a right circular cone with vertex at the point (1,0,1)which passes through the point (1,1,1) and axis of cone has direction ratios 1,1,1

A : $\sin\alpha = \frac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\sqrt{a_2^2 + b_2^2 + c_2^2}}$

B : $\cos\alpha = \frac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\sqrt{a_2^2 + b_2^2 + c_2^2}}$

C : $\cos\alpha = a_1a_2 + b_1b_2 + c_1c_2$

D : $\sin\alpha = a_1a_2 + b_1b_2 + c_1c_2$

Q.no 11. Moment of inertia of the lamina A about the y axis is equal to

A : $\int\int_A \rho x^2 dxdy$

B : $\int\int_A \rho y^2 dxdy$

C : $\int\int_A \rho(x^2 + y^2) dxdy$

D : $\int\int_A \rho x^2 y^2 dxdy$

Q.no 12. B(m,n) is equal to

A : $\int_0^1 x^{m-1}(1-x)^{n-1}dx$

B : $\int_0^\infty x^{m-1}(1-x)^{n-1}dx$

C : $\int_0^1 x^m (1-x)^n dx$

D : $\int_0^1 e^{-x} x^{n-1} dx$

Q.no 13. The value of equivalent form of gamma function $\int_0^\infty e^{-kx} x^{n-1}\, dx$ is

A : $\frac{\Gamma n}{n^k}$

B : $\frac{\Gamma n}{k^n}$

C : $\frac{\Gamma n}{k!}$

D : $\Gamma(n+k+1)$

Q.no 14. Rectilinear motion is a motion of body along a

A : Straight line

B : Circular path

C : Parabolic path

D : Hyperbolic path

Q.no 15. In a D.E. $L\frac{di}{dt} + Ri = E$, E means

A : Voltage

B : Current

C : Resistance

D : Electromotive force

Q.no 16. The value of integration $\int_0^a \int_0^b \int_0^c x^2 y^2 z^2 dxdydz$ is equal to

A : $\frac{abc}{3}$

B : $\frac{a^2b^2c^2}{3}$

C : $\frac{a^3b^3c^3}{27}$

D : $\frac{a^2b^2c^2}{9}$

Q.no 17. The value of $erf\left(3\right) + erf_c\left(3\right)$ is

A : 3

B : 2

C : 1

D : 0

Q.no 18. If double integral in Cartesian coordinate is given by $\int\int_R f(x,y)\,dxdy$ then the value of same integral in polar form is

A : $\int\int_R f(r\cos\theta, r\sin\theta)\,rdrd\theta$

B : $\int\int_R f(r\cos\theta, r\sin\theta)\,rdrd\theta$

C : $\int\int_R f(r\cos\theta, r\sin\theta)\,r^2drd\theta$

D : $\int\int_R f(r\sin\theta, r\cos\theta)\,rdrd\theta$

Q.no 19. If $I_n=\int_0^{\pi/2} sin^n x\,dx$, where n is positive even integer then I_n is calculated from

A : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}\dots\dots\frac{3}{4}.\frac{1}{2}$

B : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}......\frac{3}{4}.\frac{1}{2}.\pi$

C : $\left(\frac{n+1}{n}.\frac{n.+3}{n+2.}.\frac{n+5}{n+4}\right)......\frac{\pi}{2}$

D : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}......\frac{3}{4}.\frac{1}{2}.\frac{\pi}{2}$

Q.no 20. The integrating factor of the DE $\frac{dy}{dx} + ycosx = \frac{sin2x}{2}$ is

A : e^{cosx}

B : e^{sinx}

C : sin x

D : cos x

Q.no 21. To change Cartesian coordinates (x, y, z) to spherical polar coordinate (r, θ, ϕ);$dxdydz$ is replaced by

A : To change Cartesian coordinates (x, y, z) to spherical polar coordinate (r, θ, ϕ);$dxdydz$ is replaced by

B : $r^2 \cos\theta dr d\theta d\phi$

C : $r^2 dr d\theta d\phi$

D : $r dr d\theta d\phi$

Q.no 22. The differential equation for the current i in an electric circuit containing resistance 100 ohm and an inductance of 0.5 henery connected in series with battery of 20 volts is

A : $0.5\frac{di}{dt} + 100i = 0$

B : $$0.5\frac{di}{dt}+100i=20$$

C : $$100\frac{di}{dt}+0.5i=0$$

D : $$100\frac{di}{dt}+0.5R=0$$

Q.no 23.

If $(\bar{x},\bar{y})$ the coordinates of centroid of the plane area is given by

A : $$\bar{x}=\frac{\int\int x\rho dxdy}{\int\int \rho dxdy},\bar{y}=\frac{\int\int y\rho dxdy}{\int\int \rho dxdy}$$

B : $$\bar{x}=\frac{\int\int x^2\rho dxdy}{\int\int \rho dxdy},\bar{y}=\frac{\int\int y^2\rho dxdy}{\int\int \rho dxdy}$$

C : $$\bar{x}=\frac{\int\int \rho dxdy}{\int\int x\rho dxdy},\bar{y}=\frac{\int\int \rho dxdy}{\int\int y\rho dxdy}$$

D : None of these

Q.no 24. The integrating factor of $(x^2+y^2+x)dx+xydy=0$ using non exact rule $\frac{\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)}{N}$ is

A : x

B : 1/x

C : x2

D : xy

Q.no 25. If the equation of curve remains unchanged by replacing y by -y, then the curve is symmetric about

A : y-axis

B : line y=x

C : x-axis

D : line y=-x

Q.no 26. If q be the quantity of heat that flows across an area A cm2 and thickness δx in one second where the difference of temperature at the faces is δT, then by Fourier's law of heat conduction

A : $q = -k\left(A - \frac{dt}{dx}\right)$, where k is thermal conductivity

B : $q = kA\frac{dT}{dx}$, where k is thermal conductivity

C : $q = -k\left(A + \frac{dt}{dx}\right)$, where k is thermal conductivity

D : $q = -kA\frac{dT}{dx}$, , where k is thermal conductivity

Q.no 27. The integrating factor of $(3x^2y^4 + 2xy)dx + (2x^3y^3 - x^2)dy = 0$ using non exact rule $\frac{\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)}{M}$ is

A : y^2

B : $\frac{1}{y^2}$

C : y

D : 1/y

Q.no 28. The solution of the DE $\frac{dy}{dx} = \frac{x^2}{y^3}$ is

A : $y^3 - x^3 = c$

B : $3y^4 - 4x^3 = c$

C : $y^2 - x^3 = c$

D : $x^2 - y^2 = c$

Q.no 29. A circuit containing inductance L capacitance C in series with applied electromotive force E. By Kirchhoff's voltage law differential equation for current i is

A : $L\frac{di}{dt} + Ri = E$

B : $L\frac{di}{dt} + Ri = 0$

C : $L\frac{di}{dt} + \frac{q}{C} = E$

D : $L\frac{di}{dt} + \frac{q}{C} = 0$

Q.no 30. Error function of x, $erf\left(x\right)$ is defined as

A : $\frac{2}{\sqrt{\pi}}\int_0^x e^{-u^2}\,du$

B : $\frac{2}{\sqrt{\pi}}\int_x^\infty e^{-u^2}\,du$

C : $\int_0^\infty e^{-x}x^{n-1}\,dx$

D : $\frac{2}{\sqrt{\pi}}\int_0^\infty e^{-u^2}\,du$

Q.no 31. The integrating factor of $\frac{dy}{dx} + Py = Q$ is

A : $e^{\int p\,dx}$

B : $e^{\int p\,dy}$

C : $e^{\int Q dx}$

D : $e^{\int Q dy}$

Q.no 32. Half range Fourier cosine series for $f(x)$ defined in the interval $0 \le x \le L$ is

A : Half range Fourier cosine series for $f(x)$ defined in the interval $0 \le x \le L$ is

B : $\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos\frac{nx}{L}$

C : $\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos\frac{n\pi x}{L}$

D : $\frac{a_0}{2} + \sum_{n=1}^{\infty} \left(a_n\, cos\frac{n\pi x}{L} + b_n \sin\frac{n\pi x}{L}\right)$

Q.no 33. The necessary and sufficient condition that the Differential equation $Mdx + Ndy = 0$ is exact is

A : $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$

B : $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$

C : $\frac{\partial M}{\partial y} \neq \frac{\partial N}{\partial x}$

D : $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial x}$

Q.no 34. The general solution of Linear Differential equation $\frac{dx}{dy} + Px = Q$ where P and $Q$are functions of y or constants, is

A : $x\, e^{\int p dx} = \int Q\, e^{\int p dx} dx + c$

B : $x\, e^{\int p dy} = \int Q\, e^{\int p dy} dy + c$

C : $y\, e^{\int p dx} = \int Q\, e^{\int p dx} dx + c$

D : $y\, e^{\int p dx} = \int Q\, e^{\int p dx} dy + c$

Q.no 35.

The equation of asymptotes parallel to y-axis to the curve represented by the equation

$y^2(4-x) = x(x-2)^2$ is

A : x=2

B : y=0

C : x=4

D : x=0

Q.no 36. If the differential equation $M(x,y)dx + N(x,y)dy = 0$ is not exact and it can be written as $yf_1(x,y)dx + xf_2(x,y)dy = 0$ then integrating factor is

A : $\dfrac{1}{My+Nx}; My+Nx \neq 0$

B : $\dfrac{1}{Mx+Ny}; Mx+Ny \neq 0$

C : $\dfrac{1}{Mx-Ny}; Mx-Ny \neq 0$

D : $\dfrac{1}{My-Nx}; My-Nx \neq 0$

Q.no 37. Reduction formula for gamma function is

A : $\Gamma(n+1) = (n-1)\Gamma(n-1)$

B : $\Gamma(n+1) = n\Gamma(n)$

C : $\Gamma(n+1) = (n-1)\Gamma(n)$

D : $\Gamma(n+1) = n \quad \Gamma(n-1)$

Q.no 38. A pipe contains steam and is protected with a covering then in the formula $q = kA\,\frac{dT}{dt}$

A : $A = 2\pi r l$

B : $A = \frac{1}{3}\pi r^2 l$

C : $A = \frac{1}{3}\pi r^2 l$

D : $A = rl$

Q.no 39. If $\phi(a) = \int_0^\infty e^{-bx^2} \cos(2ax)\,dx,\ \ b>0$ then by DUIS rule $\frac{d\phi}{da}$ is

A : $\int_0^\infty \frac{\partial}{\partial b}\left[e^{-bx^2} \cos(2ax)\right] dx$

B : $e^{-bx^2} \cos(2ax)$

C : $\int_0^\infty \frac{\partial}{\partial x}\left[e^{-bx^2} \cos(2ax)\right] dx$

D : $\int_0^\infty \frac{\partial}{\partial a}\left[e^{-bx^2} \cos(2ax)\right] dx$

Q.no 40. The center and radius of the sphere $3(x^2 + y^2 + z^2) - 30x + 12y - 18z + 89 = 0$ is

A : $(10,-4,6)$, $\frac{5}{\sqrt{3}}$

B : $(15,-6,9)$, $\frac{\sqrt{203}}{\sqrt{3}}$

C : $(5,-2,3)$, $\frac{5}{\sqrt{3}}$

D : $(-5,2,-3)$, $\frac{5}{3}$

Q.no 41. Which of the following is true?

A : $erf(x) - erfc(x) = 1$

B : $erf(x) + erfc(x) = 1$

C : $erf(x) + erfc(x) = 2$

D : $erf(-x) = erf(x)$

Q.no 42. Area enclosed by the polar curve $r = f_1(\theta)$ and $r = f_2(\theta)$ and the line $\theta = \alpha, \theta = \beta \alpha < \beta$ is given by

A : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} r dr d\theta$

B : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} dr d\theta$

C : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} r^2 \sin\theta dr d\theta$

D : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} r^2 \cos\theta dr d\theta$

Q.no 43. The value of integration $\int_0^1 \int_x^{\sqrt{x}} xy dx dy$ is equal to

A : 0

B : -1/24

C : 1/24

D : 24

The solution of exact DE $(x+2y-2)dx+(2x-y+3)dy=0$ is

Q.no 44.

A : $x^2+4xy-4x+6y=c$

B : $x^2+4xy-4x-y^2+6y=c$

C : $x^2+8xy+y^2=c$

D : $x^2+4xy-\frac{y^2}{2}+y=c$

If $I(\alpha)=\int_0^1 \frac{x^\alpha-1}{\log x}dx$, $\alpha \geq 0$ then by DUIS $\frac{dI}{d\alpha}$ is

Q.no 45.

A : $\log(\alpha+1)$

B : $\log(\alpha-1)$

C : $\log\alpha$

D : 0

Q.no 46. A capacitor C=0.01 farad in series with resistor R=20 ohms is charged from battery E=10 volts. If initially capacitor is completely discharged then differential equation for charge q(t) is given by

A : $20\frac{dq}{dt}+\frac{q}{0.01}=0\ ;\ q(0)=0$

B : $20\frac{dq}{dt}+0.01q=10\ ;\ q(0)=0$

C : $20\frac{dq}{dt}+\frac{q}{0.01}=10\ ;\ q(0)=0$

D : $20\frac{dq}{dt}+0.01q=0\ ;\ q(0)=0$

Q.no 47. The value of $erf(0)+erf(\infty)$ is

A : 1

B : -1

C : 0

D : ∞

Q.no 48.

The equation of sphere which passes through the point (4, 6, 3) and passes through the circle $(x-1)^2+(y-2)^2=25,\ z=0$ is

A : $x^2+y^2+z^2-2x-4y-3z-20=0$

B : $x^2+y^2+z^2+3x-4y+3z-16=0$

C : $2x^2+2y^2+2z^2+6x-3y+2z=0$

D : $x^2+y^2+z^2+4x-4y+3z-20=0$

Q.no 49. In spherical co-ordinates volume is given by

A : $V=\int\int\int_V drd\theta d\phi$

B : $V=\int\int\int_V rdrd\theta d\phi$

C : $V=\int\int\int_V r^2\cos\theta drd\theta d\phi$

D : $V=\int\int\int_V r^2\sin\theta drd\theta d\phi$

Q.no 50. q56.jpg

A : 1

B : 0

C : q56_3.jpg

D : q56_4.jpg

Q.no 51.
The radius of the circle of intersection of the sphere $x^2 + y^2 + z^2 - 2x + 4y + 2z - 6 = 0$ by the plane $x + 2y + 2z - 4 = 0$ is:

[Centre of the circle is(2,0,1)]

A : 9

B : 3

C : 12

D : $\sqrt{3}$

Q.no 52. B(4,5)=

A : 1/280

B : 4/105

C : 1/70

D : 1/210

Q.no 53. Radius of right circular cylinder is 5and whose axis is the line $\frac{x-2}{3} = \frac{y-3}{1} = \frac{z+1}{1}$ Then the equation of right circular cylinder is

A : $(x+2)^2 + (y+3)^2 + (z+1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

B : $(x-2)^2 + (y-3)^2 + (z-1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

C : $(x+2)^2 + (y-3)^2 + (z+1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

D : $(x-2)^2 + (y-3)^2 + (z+1)^2 = 5^2 + \left(\frac{3x+y+z-8}{\sqrt{11}}\right)^2$

Q.no 54. In a circuit containing resistance R and inductance L in series with constant voltage source E current i is given by $i = \frac{E}{R}\left(1 - e^{-\frac{R}{L}t}\right)$, then maximum current $i_{\max}$ is

A : E/R

B : R/E

C : ER

D : 0

Q.no 55. The value of integration $\int_0^1 \int_0^{x^2} xe^y dxdy$ is equal to

A : e/2

B : e-1

C : 1-e

D : (e/2)-1

Q.no 56.

The value of integration $\int_0^1 \int_0^1 \int_0^1 xyzdxdydz$ is equal to

A : 0.125

B : 0.25

C : -0.125

D : 1

Q.no 57.

Area bounded by the parabola $y^2 = 4x$ and the line $y = x$ is calculated using

A : $\int_{y=0}^{4} \int_{x=y^2/4}^{y} dxdy$

B : $\int_{y=0}^{4}\int_{x=0}^{4} dxdy$

C : $\int_{y=0}^{4}\int_{x=0}^{y} dxdy$

D : $\int_{x=0}^{4}\int_{y=0}^{x} dxdy$

Q.no 58. Fourier coefficient a_0 in the Fourier series expansion of $f(x) = x\sin x\,;\, 0 \le x \le 2\pi$ and $f(x+2\pi) = f(x)$

A : 2

B : 0

C : -2

D : -4

Q.no 59. $\frac{5\pi}{128}$

A : $\frac{5\pi}{128}$

B : $\frac{3\pi}{128}$

C : $\frac{3\pi}{512}$

D : $\frac{5\pi}{64}$

Q.no 60. $\int_0^{\pi/2} cos^6 x\, dx$ is equal to

A : $\frac{5}{16}$

B : $\frac{16}{5} \cdot \frac{\pi}{2}$

C : $\frac{5}{16} \cdot \frac{\pi}{2}$

D : $\frac{5}{48} \cdot \frac{\pi}{2}$

Answer for Question No 1. is b

Answer for Question No 2. is a

Answer for Question No 3. is d

Answer for Question No 4. is c

Answer for Question No 5. is a

Answer for Question No 6. is b

Answer for Question No 7. is b

Answer for Question No 8. is d

Answer for Question No 9. is a

Answer for Question No 10. is b

Answer for Question No 11. is a

Answer for Question No 12. is a

Answer for Question No 13. is b

Answer for Question No 14. is a

Answer for Question No 15. is d

Answer for Question No 16. is c

Answer for Question No 17. is c

Answer for Question No 18. is a

Answer for Question No 19. is d

Answer for Question No 20. is b

Answer for Question No 21. is a

Answer for Question No 22. is b

Answer for Question No 23. is a

Answer for Question No 24. is a

Answer for Question No 25. is c

Answer for Question No 26. is d

Answer for Question No 27. is b

Answer for Question No 28. is b

Answer for Question No 29. is c

Answer for Question No 30. is a

Answer for Question No 31. is a

Answer for Question No 32. is c

Answer for Question No 33. is a

Answer for Question No 34. is b

Answer for Question No 35. is c

Answer for Question No 36. is c

Answer for Question No 37. is b

Answer for Question No 38. is a

Answer for Question No 39. is d

Answer for Question No 40. is c

Answer for Question No 41. is b

Answer for Question No 42. is a

Answer for Question No 43. is c

Answer for Question No 44. is b

Answer for Question No 45. is a

Answer for Question No 46. is c

Answer for Question No 47. is a

Answer for Question No 48. is a

Answer for Question No 49. is d

Answer for Question No 50. is c

Answer for Question No 51. is d

Answer for Question No 52. is a

Answer for Question No 53. is d

Answer for Question No 54. is a

Answer for Question No 55. is b

Answer for Question No 56. is a

Answer for Question No 57. is a

Answer for Question No 58. is c

Answer for Question No 59. is b

Answer for Question No 60. is c

Seat No -

Total number of questions : 60

1000505 T1 ENGINEERING MATHEMATICS II

Time : 1hr

Max Marks : 50

N.B

1) All questions are Multiple Choice Questions having single correct option.

2) Attempt any 50 questions out of 60.

3) Use of calculator is allowed.

4) Each question carries 1 Mark.

5) Specially abled students are allowed 20 minutes extra for examination.

6) Do not use pencils to darken answer.

7) Use only black/blue ball point pen to darken the appropriate circle.

8) No change will be allowed once the answer is marked on OMR Sheet.

9) Rough work shall not be done on OMR sheet or on question paper.

10) Darken ONLY ONE CIRCLE for each answer.

Q.no 1. The general solution of Linear Differential equation $\frac{dx}{dy} + Px = Q$ where P and Q are functions of y or constants, is

A : $x\, e^{\int pdx} = \int Q\, e^{\int pdx} dx + c$

B : $x\, e^{\int pdy} = \int Q\, e^{\int pdy} dy + c$

C : $y\, e^{\int pdx} = \int Q\, e^{\int pdx} dx + c$

D : $y\, e^{\int pdx} = \int Q\, e^{\int pdx} dy + c$

Q.no 2. Area enclosed by the polar curve $r = f_1(\theta)$ and $r = f_2(\theta)$ and the line $\theta = \alpha, \theta = \beta \alpha < \beta$ is given by

A : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} r dr d\theta$

B : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} dr d\theta$

C : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} r^2 \sin\theta dr d\theta$

D : $Area = \int_{\alpha}^{\beta} \int_{f_1(\theta)}^{f_2(\theta)} r^2 \cos\theta dr d\theta$

Q.no 3. If $I(\alpha)=\int_a^b f(x,\alpha)dx$ where α is parameter and $a,\ b$ are constants then by DUIS rule $\frac{dI(\alpha)}{d\alpha}$ is

A : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx$

B : $\int_a^b \frac{\partial}{\partial x} f(x,\alpha)dx$

C : $f(b,\alpha)-f(a,\alpha)$

D : $f(x,\alpha)$

Q.no 4. If $\phi(a)=\int_0^\infty e^{-bx^2}\cos(2ax)dx,\ b>0$ then by DUIS rule $\frac{d\phi}{da}$ is

A : $\int_0^\infty \frac{\partial}{\partial b}\left[e^{-bx^2}\cos(2ax)\right]dx$

B : $e^{-bx^2}\cos(2ax)$

C : $\int_0^\infty \frac{\partial}{\partial x}\left[e^{-bx^2}\cos(2ax)\right]dx$

D : $\int_0^\infty \frac{\partial}{\partial a}\left[e^{-bx^2}\cos(2ax)\right]dx$

Q.no 5. The integrating factor of the DE $cosx\frac{dy}{dx} + ysinx = 1$ is

A : sec x

B : cot x

C : tan x

D : sin x

Q.no 6. The differential equation for the current i in an electric circuit containing resistance R=250 ohm and an inductance of L=640 henery in series with an electromotive force E=500 volts is

A : $640\frac{di}{dt} + 250i = 0$

B : $250\frac{di}{dt} + 640i = 500$

C : $640\frac{di}{dt} + 250i = 500$

D : $250\frac{di}{dt} + 640i = 0$

Q.no 7. If n is a positive integer, then $\Gamma(n+1)$ is

A : (n+1)!

B : (n+2)!

C : (n-1)!

D : n!

Q.no 8. Moment of inertia of the lamina A about the x axis is equal to

A : $\int\int_A \rho x^2 dxdy$

B : $\int\int_A \rho y^2 dxdy$

C : $\int\int_A \rho(x^2+y^2)dxdy$

D : $\int\int_A \rho x^2y^2 dxdy$

Q.no 9. The integrating factor of $(y^4+2y)dx+(xy^3+2y^4-4x)dy=0$ using non exact rule $\frac{\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)}{M}$ is

A : $\frac{1}{y^3}$

B : 1/x

C : y^3

D : $\frac{1}{x^3}$

Q.no 10.

The equation of tangent to the curve at origin represented by the equation $y(1+x^2)=x$ is

A : y=x

B : x=0

C : x=1

D : y=0

Q.no 11. The solution of the DE $\frac{dy}{dx}=\frac{x^2}{y^3}$ is

A : $y^3-x^3=c$

B : $3y^4-4x^3=c$

C : $y^2-x^3=c$

D : $x^2 - y^2 = c$

Q.no 12. If $I_n = \int_0^{\pi/2} sin^n x \, dx$, where n is positive even integer then I_n is calculated from

A : $\frac{n-1}{n} \cdot \frac{n-3}{n-2.} \cdot \frac{n-5}{n-4} \cdots\cdots \frac{3}{4} \cdot \frac{1}{2}$

B : $\frac{n-1}{n} \cdot \frac{n-3}{n-2.} \cdot \frac{n-5}{n-4} \cdots\cdots \frac{3}{4} \cdot \frac{1}{2} \cdot \pi$

C : $\left(\frac{n+1}{n} \cdot \frac{n.+3}{n+2.} \cdot \frac{n+5}{n+4}\right) \cdots\cdots \frac{\pi}{2}$

D : $\frac{n-1}{n} \cdot \frac{n-3}{n-2.} \cdot \frac{n-5}{n-4} \cdots\cdots \frac{3}{4} \cdot \frac{1}{2} \cdot \frac{\pi}{2}$

Q.no 13.

Find semi-vertical angle for a right circular cone with vertex at the point $(1,0,1)$which passes through the point $(1,1,1)$ and axis of cone has direction ratios $1,1,1$

A : $\sin\alpha = \frac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\,\sqrt{a_2^2 + b_2^2 + c_2^2}}$

B : $\cos\alpha = \frac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2}\,\sqrt{a_2^2 + b_2^2 + c_2^2}}$

C : $\cos\alpha = a_1a_2 + b_1b_2 + c_1c_2$

D : $\sin\alpha = a_1a_2 + b_1b_2 + c_1c_2$

Q.no 14. The center and radius of the sphere $3(x^2 + y^2 + z^2) - 30x + 12y - 18z + 89 = 0$ is

A : $(10,-4,6)$, $\frac{5}{\sqrt{3}}$

B : $(15,-6,9)$, $\frac{\sqrt{203}}{\sqrt{3}}$

C : $(5,-2,3)$, $\frac{5}{\sqrt{3}}$

D : $(-5,2,-3)$, $\frac{5}{3}$

Q.no 15. The amount of heat Q flowing through the area per unit time is

A : Q = thermal conductivity x Area x Rate of change of temp. across an area

B : Q = thermal conductivity x Area of slab

C : Q = thermal conductivity x Area x temp. gradient

D : Q = thermal conductivity x Area + Rate of flow of heat

Q.no 16. Half range Fourier cosine series for $f(x)$ defined in the interval $0 \le x \le L$ is

A : Half range Fourier cosine series for $f(x)$ defined in the interval $0 \le x \le L$ is

B : $\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos\frac{nx}{L}$

C : $\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos\frac{n\pi x}{L}$

D : $\frac{a_0}{2} + \sum_{n=1}^{\infty} \left(a_n \cos\frac{n\pi x}{L} + b_n \sin\frac{n\pi x}{L}\right)$

Q.no 17. The integrating factor of $(x^2 + y^2 + x)dx + xydy = 0$ using non exact rule $\frac{\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)}{N}$ is

A : x

B : 1/x

C : x2

D : xy

Q.no 18. Error function of x, $erf(x)$ is defined as

A : $\frac{2}{\sqrt{\pi}}\int_0^x e^{-u^2}du$

B : $\frac{2}{\sqrt{\pi}}\int_x^\infty e^{-u^2}du$

C : $\int_0^\infty e^{-x}x^{n-1}dx$

D : $\frac{2}{\sqrt{\pi}}\int_0^\infty e^{-u^2}du$

Q.no 19. Rectilinear motion is a motion of body along a

A : Straight line

B : Circular path

C : Parabolic path

D : Hyperbolic path

Q.no 20. If the sphere $x^2 + y^2 + z^2 = 25$,

$$x^2 + y^2 + z^2 - 18x - 24y - 40z + 225 = 0$$

touches each other externally then distance between their centers is:

A : 20

B : 5

C : 15

D : 25

Q.no 21. Reduction formula for gamma function is

A : $\Gamma(n+1) = (n-1)\Gamma(n-1)$

B : $\Gamma(n+1) = n\Gamma(n)$

C : $\Gamma(n+1) = (n-1)\Gamma(n)$

D : $\Gamma(n+1) = n \quad \Gamma(n-1)$

Q.no 22. A pipe contains steam and is protected with a covering then in the formula $q = kA\,\frac{dT}{dt}$

A : $A = 2\pi r l$

B : $A = \frac{1}{3}\pi r^2 l$

C : $A = \frac{1}{3}\pi r^2 l$

D : $A = rl$

Q.no 23. The curve $xy^2 = a^2(a-x)$

A : passes through the point (-a,0)

B : does not pass through origin

C : passes through the origin

D : passes through the point (a,a)

Q.no 24. The value of the integral $\int_0^b e^{-u^2}\,du$ is

A : $\frac{2}{\sqrt{\pi}}\int_0^x e^{-u^2}\,du$

B : $\frac{\sqrt{\pi}}{2} erf\ (b)$

C : $\frac{2}{\sqrt{\pi}} erf_c(b)$

D : $erf(b)$

Q.no 25.

Condition for the two spheres $x^2 + y^2 + z^2 + 2u_1x + 2v_1y + 2w_1z + d_1 = 0$ and $x^2 + y^2 + z^2 + 2u_2x + 2v_2y + 2w_2z + d_2 = 0$ to be orthogonal is ---

A : $S + \lambda U = 0$

B : $S_1 - S_2 = 0$

C : $2u_1u_2 + 2v_1v_2 + 2w_1w_2 = d_1 + d_2$

D : $u_1u_2 + v_1v_2 + w_1w_2 = d_1 + d_2$

Q.no 26.

If $(\bar{x}, \bar{y})$ the coordinates of centroid of the plane area is given by

A : $\bar{x} = \frac{\int\int x\rho dxdy}{\int\int \rho dxdy}, \bar{y} = \frac{\int\int y\rho dxdy}{\int\int \rho dxdy}$

B : $\bar{x} = \frac{\int\int x^2\rho dxdy}{\int\int \rho dxdy}, \bar{y} = \frac{\int\int y^2\rho dxdy}{\int\int \rho dxdy}$

C : $\bar{x} = \frac{\int\int \rho dxdy}{\int\int x\rho dxdy}, \bar{y} = \frac{\int\int \rho dxdy}{\int\int y\rho dxdy}$

D : None of these

Q.no 27. Gamma function of n > 0 is defined as

A : $\int_0^\infty e^x x^{n-1}\, dx$

B : $\int_0^\infty e^x x^{n-1}\, dx$

C : $\int_0^\infty e^{-x}x^{n-1}\,dx$

D : $\int_0^\infty e^{-x}x^{1-n}\,dx$

Q.no 28. A circuit containing inductance L capacitance C in series without applied electromotive force. By Kirchhoff's voltage law differential equation for current i is

A : $L\frac{di}{dt}+\frac{q}{c}=0$

B : $L\frac{di}{dt}+Ri=0$

C : $L\frac{di}{dt}+Ri=E$

D : $L\frac{di}{dt}+\frac{q}{c}=E$

Q.no 29. According to D'Alembert's principle algebraic sum of forces acting on a body along a given direction is equal to

A : Velocity x Acceleration

B : Mass x Velocity

C : Mass x displacement

D : Mass x Acceleration

Q.no 30. If the differential equation $M(x,y)dx+N(x,y)dy=0$ is not exact and it can be written as $yf_1(x,y)dx+xf_2(x,y)dy=0$ then integrating factor is

A : $\frac{1}{My+Nx}; My+Nx\neq 0$

B : $\frac{1}{Mx+Ny}; Mx+Ny\neq 0$

C : $\dfrac{1}{Mx - Ny}$; $Mx - Ny \neq 0$

D : $\dfrac{1}{My - Nx}$; $My - Nx \neq 0$

Q.no 31. The integrating factor for the DE $\frac{dy}{dx} + \frac{x}{1+x} y = 1 + x$ is

A : $e^{x(1+x)}$

B : $e^{x(1+x)}$

C : $e^{x/(1+x)}$

D : $1 + x^2$

Q.no 32. The integrating factor of the DE $\frac{dy}{dx} + ycosx = \frac{sin2x}{2}$ is

A : e^{cosx}

B : e^{sinx}

C : sin x

D : cos x

Q.no 33. For RC circuit the charge q satisfies the linear D.E.

A : $R + \dfrac{dq}{dt} = E$

B : $Ri + q = 0$

C : $A = \frac{1}{3}\pi r^2 l$

D : $R\dfrac{dq}{dt} + \dfrac{q}{C} = E$

Q.no 34. Moment of inertia of the lamina A about the y axis is equal to

A : $\int \int_A \rho x^2 dxdy$

B : $\int \int_A \rho y^2 dxdy$

C : $\int \int_A \rho(x^2 + y^2) dxdy$

D : $\int \int_A \rho x^2 y^2 dxdy$

Q.no 35. The integrating factor of $(3x^2y^4 + 2xy)dx + (2x^3y^3 - x^2)dy = 0$ using non exact rule $\frac{\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)}{M}$ is

A : y^2

B : $\frac{1}{y^2}$

C : y

D : 1/y

Q.no 36. A particle moving in straight line with acceleration $k(x + \frac{a^4}{x^3})$ directed towards origin. The equation of motion is

A : $\frac{dv}{dx} = -k(x + \frac{a^4}{x^3})$

B : $v\frac{dv}{dx} = k(x + \frac{a^4}{x^3})$

C : $v\frac{dv}{dx} = -k(x + \frac{a^4}{x^3})$

D : $\frac{dv}{dx} = (x + \frac{a^4}{x^3})$

Q.no 37. A circuit containing inductance L capacitance C in series with applied electromotive force E. By Kirchhoff's voltage law differential equation for current i is

A : $L\frac{di}{dt} + Ri = E$

B : $L\frac{di}{dt} + Ri = 0$

C : $L\frac{di}{dt} + \frac{q}{C} = E$

D : $L\frac{di}{dt} + \frac{q}{C} = 0$

Q.no 38. The integrating factor for the DE $(1 + x^2)\frac{dy}{dx} + xy = 0$ is

A : e^{1+x^2}

B : $\log(x^2 + 1)$

C : $\sqrt{x^2 + 1}$

D : $1 + x^2$

Q.no 39. The value of integration $\int_0^a \int_0^b \int_0^c x^2y^2z^2dxdydz$ is equal to

A : $\frac{abc}{3}$

B : $\frac{a^2b^2c^2}{3}$

C : $\frac{a^3b^3c^3}{27}$

D : $\frac{a^2b^2c^2}{9}$

Q.no 40. The value of equivalent form of gamma function $\int_0^\infty e^{-kx}x^{n-1}\,dx$ is

A : $\frac{\Gamma n}{n^k}$

B : $\frac{\Gamma n}{k^n}$

C : $\frac{\Gamma n}{k!}$

D : $\Gamma(n+k+1)$

Q.no 41. The value of $\int\int\int_V dxdydz$ where V is the volume bounded by $x^2+y^2+z^2=1$

A : $\frac{4}{3}\pi$

B : 4π

C : π

D : $\frac{1}{3}\pi$

Q.no 42. If double integral in Cartesian coordinate is given by $\int\int_R f(x,y)\,dxdy$ then the value of same integral in polar form is

A : $\int\int_R f(r\cos\theta, r\sin\theta)\,rdrd\theta$

B : $\int\int_R f(r\cos\theta, r\sin\theta)\,rdrd\theta$

C : $\int\int_R f(r\cos\theta, r\sin\theta)\,r^2drd\theta$

D : $\int\int_R f(r\sin\theta, r\cos\theta)\,rdrd\theta$

Q.no 43. The solution of the DE $\frac{dy}{dx}+y=e^{-x}$ is

A : $ye^{-x} + c = x$

B : $ye^{x} + x = c$

C : $ye^{x} = x + c$

D : $y = x + c$

Q.no 44.

The two spheres $x^2 + y^2 + z^2 - 12x - 18y - 24z + 29 = 0$ and $x^2 + y^2 + z^2 + 3x - 3y + 3z - 56 = 0$

A : touches each other internally

B : touches each other externally

C : touches each other Orthogonally

D : Intersecting each other

Q.no 45.

If $I(\alpha) = \int_a^b f(x,\alpha)dx$ where a, b are function of parameter α then by DUIS rule $\frac{dI(\alpha)}{d\alpha}$ is

A : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx + f(a,\alpha)\frac{da}{d\alpha} - f(b,\alpha)\frac{db}{d\alpha}$

B : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx + f(b,\alpha)\frac{db}{d\alpha} - f(a,\alpha)\frac{da}{d\alpha}$

C : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx + f(b,\alpha)\frac{db}{d\alpha} - f(a,\alpha)\frac{da}{d\alpha}$

D : $\int_a^b \frac{\partial}{\partial\alpha} f(x,\alpha)dx$

Q.no 46. In spherical co-ordinates volume is given by

A : $V = \int \int \int_V drd\theta d\phi$

B : $V = \int \int \int_V rdrd\theta d\phi$

C : $V = \int \int \int_V r^2 \cos\theta drd\theta d\phi$

D : $V = \int \int \int_V r^2 \sin\theta drd\theta d\phi$

Q.no 47. B(4,5)=

A : 1/280

B : 4/105

C : 1/70

D : 1/210

Q.no 48. A particle of mass m moves in a horizontal straight line OA with acceleration $\frac{k}{x^3}$ at a distance x and directed towards origin O. Then the differential equation of motion is

A : $v\frac{dv}{dx} = \frac{k}{x^3}$

B : $v\frac{dv}{dx} = -\frac{k}{x^3}$

C : $\frac{dv}{dx} = -\frac{k}{x^3}$

D : $\frac{dv}{dx} = \frac{k}{x^3}$

Q.no 49.

If the plane $4x - 3y + 6z - 35 = 0$ is tangential to the sphere

$x^2 + y^2 + z^2 - y - 2z - 14 = 0$ then the length of perpendicular from any point P on the plane is---

A : $\frac{61}{2}$

B : $\frac{61}{2}$

C : 30

D : $-\frac{\sqrt{61}}{2}$

Q.no 50.

Area bounded by the parabola $y^2 = 4x$ and the line $y = x$ is calculated using

A : $\int_{y=0}^{4} \int_{x=y^2/4}^{y} dxdy$

B : $\int_{y=0}^{4} \int_{x=0}^{4} dxdy$

C : $\int_{y=0}^{4} \int_{x=0}^{y} dxdy$

D : $\int_{x=0}^{4} \int_{y=0}^{x} dxdy$

Q.no 51.

The value of integration $\int_0^1 \int_0^x (x^2 + y^2)\, dxdy$ is equal to

A : 4/3

B : 5/3

C : 2/3

D : 1

Q.no 52. q56.jpg

A : 1

B : 0

C : q56_3.jpg

D : q56_4.jpg

Q.no 53. If $I(\alpha)=\int_0^1 \frac{x^{\alpha}-1}{\log x}dx$, $\alpha \geq 0$ then by DUIS $\frac{dI}{d\alpha}$ is

A : $\log(\alpha+1)$

B : $\log(\alpha-1)$

C : $\log\alpha$

D : 0

Q.no 54. $B\left(\frac{1}{4},\frac{3}{4}\right)$ is equal to

A : $\frac{2\pi}{\sqrt{3}}$

B : $\frac{2\pi}{\sqrt{3}}$

C : 0

D : $\pi\sqrt{2}$

Q.no 55. If $I(\alpha)=\int_0^1 \frac{x^{\alpha}-1}{\log x}dx$, $\alpha \geq 0$ then by DUIS $\frac{dI}{d\alpha}$ is

A : $\int_0^1 \log x \, dx$

B : $\int_0^1 x^{\alpha} \log x \, dx$

C : $\int_0^1 x^{\alpha} dx$

D : $\int_0^1 x^{-\alpha} dx$

Q.no 56. If $I_n=\int_0^{\pi/2} cos^n x \, dx$ then which of the following relation is true?

A : $\frac{n-1}{n}.\frac{n-3}{n-2.}.\frac{n-5}{n-4}......\frac{3}{4}.\frac{1}{2}$

B : $I_n=\frac{n}{n-1} I_{n-2}$

C : $I_n=\frac{n-1}{n} I_{n-2}$

D : $I_n=n(n+1) I_{n-1}$

Q.no 57. A capacitor C=0.01 farad in series with resistor R=20 ohms is charged from battery E=10 volts. If initially capacitor is completely discharged then differential equation for charge q(t) is given by

A : $20\frac{dq}{dt}+\frac{q}{0.01}=0 \; ; \; q(0)=0$

B : $20\frac{dq}{dt}+0.01q=10 \; ; \; q(0)=0$

C : $20\frac{dq}{dt}+\frac{q}{0.01}=10 \; ; \; q(0)=0$

D : $20\frac{dq}{dt} + 0.01q = 0$; $q(0) = 0$

Q.no 58. Fourier coefficient a_0 in the Fourier series expansion of

$f(x) = x\sin x$; $0 \le x \le 2\pi$ and $f(x + 2\pi) = f(x)$

A : 2

B : 0

C : -2

D : -4

Q.no 59. The value of a_0 in harmonic analysis of y for the following tabulated data is

x	0	1	2	3	4	5	6
y	9	18	24	28	26	20	9

A : 17.85

B : 20.83

C : 35.71

D : 41.66

Q.no 60.

The value of integration $\int_0^1 \int_{x^2}^{x} xy(x+y)dxdy$ is equal to

A : 3/15

B : 2/15

C : 4/15

D : 1/15

Answer for Question No 1. is b

Answer for Question No 2. is a

Answer for Question No 3. is a

Answer for Question No 4. is d

Answer for Question No 5. is a

Answer for Question No 6. is c

Answer for Question No 7. is d

Answer for Question No 8. is b

Answer for Question No 9. is a

Answer for Question No 10. is a

Answer for Question No 11. is b

Answer for Question No 12. is d

Answer for Question No 13. is b

Answer for Question No 14. is c

Answer for Question No 15. is c

Answer for Question No 16. is c

Answer for Question No 17. is a

Answer for Question No 18. is a

Answer for Question No 19. is a

Answer for Question No 20. is d

Answer for Question No 21. is b

Answer for Question No 22. is a

Answer for Question No 23. is b

Answer for Question No 24. is b

Answer for Question No 25. is c

Answer for Question No 26. is a

Answer for Question No 27. is c

Answer for Question No 28. is a

Answer for Question No 29. is d

Answer for Question No 30. is c

Answer for Question No 31. is c

Answer for Question No 32. is b

Answer for Question No 33. is d

Answer for Question No 34. is a

Answer for Question No 35. is b

Answer for Question No 36. is c

Answer for Question No 37. is c

Answer for Question No 38. is b

Answer for Question No 39. is c

Answer for Question No 40. is b

Answer for Question No 41. is a

Answer for Question No 42. is a

Answer for Question No 43. is c

Answer for Question No 44. is c

Answer for Question No 45. is c

Answer for Question No 46. is d

Answer for Question No 47. is a

Answer for Question No 48. is b

Answer for Question No 49. is a

Answer for Question No 50. is a

Answer for Question No 51. is c

Answer for Question No 52. is c

Answer for Question No 53. is a

Answer for Question No 54. is d

Answer for Question No 55. is c

Answer for Question No 56. is c

Answer for Question No 57. is c

Answer for Question No 58. is c

Answer for Question No 59. is d

Answer for Question No 60. is b

Sinhgad College of Engineering,Vadgaon

Engineering Mathematics – II

Unit 5- Solid Geometry

1) Equation of sphere whose Centre at (2, -3,1) and radius is 5 is

A) $x^2 + y^2 + z^2 - 4x + 6y - 2z - 11 = 0$

B) $x^2 + y^2 + z^2 - 8x + 12y - 4z - 11 = 0$

C) $x^2 + y^2 + z^2 - 4x + 4y - 6z - 13 = 0$

D) $x^2 + y^2 + z^2 - 8x + 12y - 4z - 13 = 0$

Ans- A

2)Equation of spere with Centre at (2, -2,3) and passing through (7,-3,5) is

A) $x^2 + y^2 + z^2 - 4x + 6y - 2z - 11 = 0$

B) $x^2 + y^2 + z^2 - 8x + 12y - 4z - 11 = 0$

C) $x^2 + y^2 + z^2 - 4x + 4y - 6z - 13 = 0$

D) $x^2 + y^2 + z^2 - 8x + 12y - 4z - 13 = 0$

Ans-C

3)Equation of sphere passing through origin and making equal intercepts of unit length on axes is

A) $x^2 + y^2 + z^2 - x - y - z = 0$

B) $x^2 + y^2 + z^2 = 0$

C) $x^2 + y^2 + z^2 - x + y - z = 0$

D) $x^2 + y^2 + z^2 - x - y - z - 1 = 0$

Ans-A

4)equation of spere passing through (1,3,1), (2,-1,1),(1,2,0),(1,-1,1) is

A) $x^2 + y^2 + z^2 - 4x + 2y - 2z + 8 = 0$

B) $x^2 + y^2 + z^2 - 4x + 2y - 2z - 8 = 0$

C) $x^2 + y^2 + z^2 + 4x + 2y - 2z + 8 = 0$

D) $x^2 + y^2 + z^2 - 4x + 2y + 2z + 8 = 0$

Ans-B

5)spherical coordinates of a point (3,4,5) are-

A)3,4,5 B)$5\sqrt{2}, 45^0, 53.13^0$

C) $5, 45^0, 53^0$ D) $\sqrt{3}, 126.26^0, 135^0$

Ans-B

6) spherical coordinates of a point (-1,1, -1) are-

A) $5\sqrt{3}, 126.26^0, 135^0$ B)$5\sqrt{2}, 45^0, 53.13^0$

C) $5, 45^0, 53^0$ D) $\sqrt{3}, 126.26^0, 135^0$

Ans-D

7) $x^2 + y^2 + z^2 - 4x + 6y - 2z - 11 = 0$ is equation of sphere then Centre and radius are

A) (-2, 3, -1),5 B) (2, -3,1),25 C) (-2, 3, -1),25 D) (2, -3,1),5

Ans-D

8) two spheres $x^2+y^2 + z^2 - 2x + 4y - 4z = 0$ and

$x^2+y^2 + z^2 + 10x + 2z + 10 = 0$ touch each other then the point of contact is

A) $\left(\frac{-11}{7}, \frac{-8}{7}, \frac{-5}{7}\right)$ B) $\left(\frac{11}{7}, \frac{8}{7}, \frac{5}{7}\right)$ C) $\left(\frac{-11}{7}, \frac{-8}{7}, \frac{5}{7}\right)$ D) $\left(\frac{-11}{7}, \frac{8}{7}, \frac{5}{7}\right)$

Ans-c

9) the equation of the sphere tangential to the plane $x - 2y - 2z = 7$ at $(3,-1,-1)$ and passing through the point $(1,1,-3)$ is

A) $x^2 + y^2 + z^2 - 10y - 10z - 31 = 0$

B) $x^2 + y^2 + z^2 - 10y - 10z + 31 = 0$

C) $x^2 + y^2 + z^2 + 10y - 10z - 31 = 0$

D) $x^2 + y^2 + z^2 + 10y + 10z + 31 = 0$

Ans-A

10) the equation of the sphere which passed through $(3,1,2)$ and meets XOY plane in a circle of radius 3 units with the center at $(1,-2,0)$ is

A) $x^2 + y^2 + z^2 + 2x + 4y - 4z - 4 = 0$

B) $x^2 + y^2 + z^2 - 2x + 4y - 4z - 4 = 0$

C) $x^2 + y^2 + z^2 - 2x - 4y - 4z - 4 = 0$

D) $x^2 + y^2 + z^2 - 2x + 4y + 4z + 4 = 0$

Ans-B

11) Find the equation of the sphere passing through the circle $x^2+y^2 + z^2 = 9$, $2x + 3y + 4z = 5$, and point $(1,2,3)$ is

A) $(x^2 + y^2 + z^2) - 2x - 3y - 4z - 22 = 0$

B) $(x^2 + y^2 + z^2) - 2x - 3y - 4z - 22 = 0$

C) $3(x^2 + y^2 + z^2) - 2x - 3y - 4z - 22 = 0$

D) $(x^2 + y^2 + z^2) - 2x - 3y - 4z - 22 = 0$

Ans-C

12) the equation of the sphere through the circle

$x^2+y^2+z^2-x+9y-5z-5=0,\ x^2+y^2+z^2+10y-4z-8=0$ as a great circle is

A) $x^2+y^2+z^2+4x+6y-8z+4=0$

B) $x^2+y^2+z^2-4x+6y-8z-4=0$

C) $x^2+y^2+z^2-4x+6y+8z+4=0$

D) $x^2+y^2+z^2-4x+6y-8z+4=0$

Ans-D

13) the equation of the sphere passing through the circle $3x-4y+5z-15=0$, and $x^2+y^2+z^2-2x+3y-4z+6=0$, and cuts the sphere $x^2+y^2+z^2+2x+4y-6z+11=0$ orthogonally is

A) $5(x^2+y^2+z^2)-13x+19y-25z+45=0$

B) $5(x^2+y^2+z^2)+13x+19y-25z+45=0$

C) $5(x^2+y^2+z^2)-13x-19y-25z+45=0$

D) $5(x^2+y^2+z^2)-13x+19y-25z-45=0$

Ans-A

14) Consider two sphere

$S_1 \equiv x^2+y^2+z^2+2u_1x+2v_1y+2w_1z+d_1=0$

$S_2 \equiv x^2+y^2+z^2+2u_2x+2v_2y+2w_2z+d_2=0$

Then condition for orthogonality is

A) $2u_1u_2+2v_1v_2+2w_1w_2=d_1-d_2$
B) $2u_1u_2-2v_1v_2+2w_1w_2=d_1+d_2$
C) $2u_1u_2-2v_1v_2-2w_1w_2=d_1-d_2$
D) $2u_1u_2+2v_1v_2+2w_1w_2=d_1+d_2$

Ans-D

15) The center of the circle, which is an intersection of the sphere,

$x^2+y^2+z^2-2y-4z-11=0$ by the plane $x+2y+2z=15$ is

A) (1,3,4) B) (1,2,3) C) (0,0,0) D) (1,3,2)

Ans-A

16)The Equation of Right circular cone whose vertex is at (α,β,γ), semi-vertical angle θ and the line Axis $\frac{x-\alpha}{l}=\frac{y-\beta}{m}=\frac{z-\gamma}{n}$ is

A) $cos\theta=\frac{l(x+\alpha)+m(y+\beta)+n(z+\gamma)}{\sqrt{l^2+m^2+n^2}\sqrt{(x-\alpha)^2+(y-\beta)^2+(z-\gamma)^2}}$

B) $cos\theta=\frac{l(x-\alpha)-m(y-\beta)-n(z-\gamma)}{\sqrt{l^2+m^2+n^2}\sqrt{(x-\alpha)^2+(y-\beta)^2+(z-\gamma)^2}}$

C) $cos\theta=\frac{l(x-\alpha)+m(y-\beta)+n(z-\gamma)}{\sqrt{l^2-m^2-n^2}\sqrt{(x-\alpha)^2-(y-\beta)^2-(z-\gamma)^2}}$

D) $cos\theta=\frac{l(x-\alpha)+m(y-\beta)+n(z-\gamma)}{\sqrt{l^2+m^2+n^2}\sqrt{(x-\alpha)^2+(y-\beta)^2+(z-\gamma)^2}}$

Ans. D

17) Equation of Right Circular cone with vertex at (1,2,3) and axis of cone $\frac{x-1}{2}=\frac{y-2}{-1}=\frac{z-3}{4}$ and semi-Vertical angle 60^0 is given by

A) $cos60=\frac{2(x-1)-1(y-2)+4(z-3)}{\sqrt{2^2+(-1)^2+4^2}\sqrt{(x-1)^2+(y-2)^2+(z-3)^2}}$

B) $cos60=\frac{2(x-1)+1(y-2)+4(z-3)}{\sqrt{2^2+(-1)^2+4^2}\sqrt{(x-1)^2+(x-2)^2+(x-3)^2}}$

C) $cos60=\frac{2(x-1)-1(y-2)-4(z-3)}{\sqrt{2^2+(-1)^2+4^2}\sqrt{(x-1)^2+(x-2)^2+(x-3)^2}}$

D) $cos60=\frac{2(x-1)-1(y-2)+4(z-3)}{\sqrt{2^2-(1)^2+4^2}\sqrt{(x-1)^2+(x-2)^2+(x-3)^2}}$

Ans. A

18) Equation of Right Circular cone with vertex at (-1,-2,-3) and axis of cone

$\frac{x+1}{3} = \frac{y+2}{1} = \frac{z+3}{4}$ and semi-Vertical angle 30° is given by

A) $cos30 = \frac{3(x+1)-1(y+2)-4(z+3)}{\sqrt{3^2+1^2+4^2}\,\sqrt{(x+1)^2+(x+2)^2+(x+3)^2}}$

B) $cos30 = \frac{3(x+1)+1(y+2)+4(z+3)}{\sqrt{3^2+1^2+4^2}\,\sqrt{(x+1)^2+(y+2)^2+(z+3)^2}}$

C) $cos30 = \frac{3(x-1)-1(y-2)-4(z-3)}{\sqrt{3^2+1^2+4^2}\,\sqrt{(x-1)^2+(y-2)^2+(z-3)^2}}$

D) $cos30 = \frac{3(x-1)+1(y-2)+4(z-3)}{\sqrt{3^2+1^2+4^2}\,\sqrt{(x-1)^2+(x-2)^2+(x-3)^2}}$

Ans. B

19) Equation of Right Circular cone with vertex at (1,2,3) and axis of cone

$\frac{x-1}{2} = \frac{y-2}{-1} = \frac{z-3}{4}$ and semi-Vertical angle 60^0 is given by

A) $21[(x-1)^2 + (y-2)^2 + (z-3)^2] = 4[2x - y + 4z - 12]^2$

B) $21[(x+1)^2 + (y+2)^2 + (z+3)^2] = 4[2x - y + 4z - 12]^2$

C) $4[(x-1)^2 + (y-2)^2 + (z-3)^2] = 25[2x - y + 4z - 12]^2$

D) $4[(x+1)^2 + (y+2)^2 + (z+3)^2] = 25[2x - y + 4z - 12]^2$

Ans. A

20) Equation of Right Circular cone with vertex at (1,1,1) and axis of cone

$\frac{x-1}{1} = \frac{y-1}{2} = \frac{z-1}{3}$ and semi-Vertical angle $\frac{\pi}{4}$ is given by

A) $2[(x-1)^2 + (y-1)^2 + (z-1)^2] = 14[x + 2y + 3z - 6]^2$

B) $14[(x-1)^2 + (y-1)^2 + (z-1)^2] = 2[x + 2y + 3z + 6]^2$

C) $14[(x-1)^2 + (y-1)^2 + (z-1)^2] = 2[x + 2y + 3z - 6]^2$

D) $2[(x-1)^2 + (y-1)^2 + (z-1)^2] = 14[x + 2y + 3z + 6]^2$

Ans. C

21) Semi- vertical angle of right circular cone which passes through the point (2,1,3) with vertex at $(1,1,2)$ and axis parallel to the line $\frac{x-2}{2} = \frac{y-1}{-4} = \frac{z+2}{3}$ is...

A) $cos\theta = \frac{5}{\sqrt{29}}$ B) $cos\theta = \frac{5}{\sqrt{58}}$ C) $cos\theta = \frac{-5}{\sqrt{58}}$ D) $cos\theta = \frac{-5}{\sqrt{29}}$

Ans. B

22) Semi- vertical angle of right circular cone with vertex at (0,0,2) direction ratio of generator are 0, 3, -2 and axis is z-axis is given by

A) $cos\theta = \frac{-4}{\sqrt{23}}$ B) $cos\theta = \frac{4}{\sqrt{23}}$ C) $cos\theta = \frac{2}{\sqrt{13}}$ D) $cos\theta = \frac{-2}{\sqrt{13}}$

Ans. D

23) Semi vertical angle of right circular cone having its vertex at $(0,0,0)$ and which passes through the point (2,-2,1) and axis parallel to the line

$\frac{x-2}{5} = \frac{y-1}{1} = \frac{z+2}{1}$

A) $cos\theta = \frac{9}{\sqrt{9}\sqrt{27}}$ B) $cos\theta = \frac{13}{\sqrt{9}\sqrt{27}}$ C) $cos\theta = \frac{-9}{\sqrt{9}\sqrt{27}}$ D) $cos\theta = \frac{-13}{\sqrt{9}\sqrt{27}}$

Ans. A

24) Semi vertical angle of right circular cone having its vertex at $(0,0,0)$ and direction ratio of one of the generator of cone are $1, -2,\ 2$ and axis makes equal angles with co-ordinate axes is given by

A) $cos\theta = \frac{-1}{3\sqrt{3}}$ B) $cos\theta = \frac{-3}{3\sqrt{3}}$ C) $cos\theta = \frac{1}{3\sqrt{3}}$ D) $cos\theta = \frac{3}{3\sqrt{3}}$

Ans. C

25) Semi vertical angle of Right Circular cone which passes through the point $(1,1,2)$ and has its axis as Line $6x = -3y = 4z$ and vertex origin is …

A) $cos\theta = \frac{-4}{\sqrt{174}}$ B) $cos\theta = \frac{12}{\sqrt{23}}$ C) $cos\theta = \frac{-12}{\sqrt{13}}$ D) $cos\theta = \frac{4}{\sqrt{174}}$

Ans. D

26) The Equation of Right circular cone whose vertex is at (0,0,0) semi-vertical angle θ and the line Axis $\frac{x}{l}=\frac{y}{m}=\frac{z}{n}$ is

A) $cos\theta = \frac{l(x)+m(y)+n(z)}{\sqrt{l^2+m^2+n^2}\sqrt{(x)^2+(y)^2+(z)^2}}$ B) $cos\theta = \frac{l(x)-m(y)-n(z)}{\sqrt{l^2+m^2+n^2}\sqrt{(x)^2+(y)^2+(z)^2}}$

C) $cos\theta = \frac{l(x)+m(y)+n(z)}{\sqrt{l^2-m^2-n^2}\sqrt{(x)^2-(y)^2-(z)^2}}$ D) $cos\theta = \frac{l(x)+m(y)+n(z)}{\sqrt{l^2+m^2+n^2}\sqrt{(x)^2-(y)^2-(z)^2}}$

Ans. A

27) Equation of Right Circular cone with vertex at (0,0,0) and axis of cone $\frac{x}{2}=\frac{y}{-1}=\frac{z}{2}$ and semi vertical angle $\frac{\pi}{4}$ is given by

A) $cos\frac{\pi}{4} = \frac{2(x)-1(y)+2(z)}{\sqrt{(2)^2-(1)^2-(2)^2}\sqrt{(x)^2-(y)^2-(z)^2}}$

B) $cos\frac{\pi}{4} = \frac{2(x)-1(y)+2(z)}{\sqrt{(2)^2+(-1)^2+(2)^2}\sqrt{(x)^2-(y)^2-(z)^2}}$

C) $cos\frac{\pi}{4} = \frac{2(x)-1(y)+2(z)}{\sqrt{(2)^2+(-1)^2+(2)^2}\sqrt{(x)^2+(y)^2+(z)^2}}$

D) $cos\frac{\pi}{4} = \frac{2(x)+1(y)+2(z)}{\sqrt{(2)^2-(-1)^2+(2)^2}\sqrt{(x)^2+(y)^2+(z)^2}}$

Ans. C

28) Equation of Right Circular cone with vertex at (0,0,0) and axis of cone $\frac{x}{2}=\frac{y}{-1}=\frac{z}{2}$ and semi vertical angle $\frac{\pi}{4}$ is given by

A) $x^2+y^2+z^2+8xy-16xz-8yz=0$

B) $x^2+7y^2+z^2+8xy-16xz+8yz=0$

C) $x^2+7y^2+z^2+8xy-16xz-8yz=0$

D) $x^2+8y^2+z^2+8xy-16xz+8yz=0$

Ans. B

29) Equation of Right Circular cone with vertex at $(0,0,0)$ and axis of cone $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ and semi vertical angle $\frac{\pi}{6}$ is given by

A) $\frac{1}{2} \quad = \frac{x+2y+2z}{\sqrt{14}\sqrt{(x)^2+(y)^2+(z)^2}}$ B) $\frac{\sqrt{3}}{2} \quad = \frac{x-2y-3z}{\sqrt{14}\sqrt{(x)^2+(y)^2+(z)^2}}$

C) $\frac{1}{2} \quad = \frac{x+2y+3z}{\sqrt{14}\sqrt{(x)^2-(y)^2-(z)^2}}$ D) $\frac{\sqrt{3}}{2} \quad = \frac{x+2y+3z}{\sqrt{14}\sqrt{(x)^2+(y)^2+(z)^2}}$

Ans. D

30) Equation of Right circular cone with vertex at $(0,0,0)$ and direction ratio of axis of cone are 5, 1, 1 and $cos\theta = \frac{9}{\sqrt{9}\sqrt{27}}$ is given by

A) $\frac{9}{\sqrt{9}\sqrt{27}} \quad = \frac{5x+y+z}{\sqrt{(5)^2-(1)^2-(1)^2}\sqrt{(x)^2+(y)^2+(z)^2}}$ B) $\frac{9}{\sqrt{9}\sqrt{27}} \quad = \frac{5x+y+z}{\sqrt{(5)^2+(1)^2+(1)^2}\sqrt{(x)^2+(y)^2+(z)^2}}$

C) $\frac{9}{\sqrt{9}\sqrt{27}} \quad = \frac{5x-y-z}{\sqrt{(5)^2-(1)^2-(1)^2}\sqrt{(x)^2+(y)^2+(z)^2}}$ D) $\frac{9}{\sqrt{9}\sqrt{27}} \quad = \frac{5x-y-z}{\sqrt{(5)^2+(1)^2+(1)^2}\sqrt{(x)^2+(y)^2+(z)^2}}$

Ans. B

31) Equation of Right circular cone with vertex at $(0,0,0)$ and has its axis as Line

$6x = -3y = 4z$ and $cos\theta = \frac{4}{\sqrt{174}}$ is given by

A) $\frac{4}{\sqrt{174}} \quad = \frac{2x+4y+3z}{\sqrt{29}\sqrt{(x)^2+(y)^2+(z)^2}}$

B) $\frac{4}{\sqrt{174}} \quad = \frac{2x-4y+3z}{\sqrt{29}\sqrt{(x)^2+(y)^2+(z)^2}}$

C) $\frac{4}{\sqrt{174}} \quad = \frac{6x-3y+4z}{\sqrt{29}\sqrt{(x)^2+(y)^2+(z)^2}}$

D) $\frac{4}{\sqrt{174}} \quad = \frac{6x+3y+4z}{\sqrt{29}\sqrt{(x)^2+(y)^2+(z)^2}}$

Ans. B

32) Equation of Right circular cone with vertex at $(0,0,0)$ and direction ratio of axis of cone are 5, 1, 1 and $cos\theta = \frac{9}{\sqrt{9}\sqrt{27}}$ is given by

A) $8x^2 - 4y^2 - 4z^2 + 5xy + yz + 5xz = 0$

B) $8x^2 + 4y^2 - 8z^2 + 5xy - yz - 5xz = 0$

C) $8x^2 + 4y^2 - 8z^2 + 5xy - yz + 5xz = 0$

D) $8x^2 + 4y^2 - 4z^2 + 5xy - yz - 5xz = 0$

Ans. A

33) Equation of Right circular cone with vertex at $(0,0,0)$ axis is the y axis and semi vertical angle 30^0 is given by

A) $\frac{\sqrt{3}}{2} = \frac{y}{\sqrt{(x)^2+(y)^2+(z)^2}}$ B) $\frac{1}{2} = \frac{y}{\sqrt{(x)^2+(y)^2+(z)^2}}$

C) $\frac{\sqrt{3}}{2} = \frac{x+z}{\sqrt{(x)^2+(y)^2+(z)^2}}$ D) $\frac{1}{2} = \frac{x+z}{\sqrt{(x)^2+(y)^2+(z)^2}}$

Ans. A

34) Equation of Right circular cone with vertex at (0,0,0) axis is the y axis and semi vertical angle 30^0 is given by

A) $3x^2 + y^2 + 3z^2 = 0$ B) $3x^2 - y^2 + 3z^2 = 0$

C) $x^2 - y^2 + 3z^2 = 0$ D) $3x^2 - y^2 - 3z^2 = 0$

Ans. B

35) Equation of Right circular cone with vertex at $(0, 0, 0)$ axis is the z axis and semi vertical angle 45^0 is

$A) \frac{1}{\sqrt{2}} = \frac{-z}{\sqrt{(x)^2+(y)^2+(z)^2}}$

$B) \frac{1}{\sqrt{2}} = \frac{z}{\sqrt{(x)^2+(y)^2+(z)^2}}$

$C) \frac{1}{\sqrt{2}} = \frac{x-y}{\sqrt{(x)^2+(y)^2+(z)^2}}$

$D) \frac{1}{\sqrt{2}} = \frac{x+y}{\sqrt{(x)^2+(y)^2+(z)^2}}$

Ans. B

36) Direction ratio of axis of Right Circular cone which passes through the point $(1,1,2)$ and has its axis as Line $6x = -3y = 4z$ and vertex origin is given by

A) $6, -3, 4$ B) $2, -4, 3$ C) $2, 4, -3$ D) $-6, 3, -4$

Ans. B

37) Direction ratio of axis of Right Circular cone which passes through the point (1,1,2) and has its axis as Line $2x = -y = 4z$ and vertex origin is given by

A) $-1, -2, -2$ B) $-2, 1, -4$ C) $1, -2, 2$ D) $2, -4, 1$

Ans. D

38)The equation of the right circular cylinder whose radius r and axis is the line $\frac{x-\alpha}{l}=\frac{y-\beta}{m}=\frac{z-\gamma}{n}$ is...

A) $(x-\alpha)^2+(y-\beta)^2+(z-\gamma)^2-\left\{\frac{l(x-\alpha)+m(y-\beta)+n(z-\gamma)}{\sqrt{l^2+m^2+n^2}}\right\}^2=r^2$

B) $(x-\alpha)^2+(y-\beta)^2+(z-\gamma)^2+\left\{\frac{l(x-\alpha)+m(y-\beta)+n(z-\gamma)}{\sqrt{l^2+m^2+n^2}}\right\}^2=r^2$

C) $(x-\alpha)^2+(y-\beta)^2+(z-\gamma)^2-\left\{\frac{(x-\alpha)+(y-\beta)+(z-\gamma)}{\sqrt{l^2+m^2+n^2}}\right\}^2=r^2$

D) $(x-\alpha)^2+(y-\beta)^2+(z-\gamma)^2-\left\{\frac{l(x+\alpha)+m(y+\beta)+n(z+\gamma)}{\sqrt{l^2+m^2+n^2}}\right\}^2=r^2$

Ans. A

39) The equation of the right circular cylinder whose radius 2 and axis is the line $\frac{x-1}{2}=\frac{y-2}{1}=\frac{z-3}{2}$ is...

A) $(x-1)^2+(y-2)^2+(z-3)^2-\left\{\frac{2(x-1)+1(y-2)+1(z-3)}{3}\right\}^2=4$

B) $(x-1)^2+(y-2)^2+(z-3)^2+\left\{\frac{2(x-1)+1(y-2)+1(z-3)}{3}\right\}^2=4$

C) $(x-1)^2+(y-2)^2+(z-3)^2-\left\{\frac{(x-1)+(y-2)+(z-3)}{3}\right\}^2=4$

D) $(x-1)^2+(y-2)^2+(z-3)^2-\left\{\frac{2(x+1)+1(y+2)+1(z+3)}{3}\right\}^2=4$

Ans. A

40) The radius of right circular cylinder whose axis is $\frac{x-2}{2}=\frac{y-1}{1}=\frac{z}{3}$ and which passes through the point (0,0,3) is…

A) $\sqrt{\frac{10}{7}}$ B) $\frac{90}{7}$ C) $\sqrt{\frac{90}{7}}$ D) $\frac{10}{7}$

Ans. C

41) Equation of right circular cylinder of radius a, whose axis passes through the origin and makes equal angles with co-ordinate axes is..

A) $2(x^2+y^2+z^2+xy+yz+zx)=a^2$

B) $2(x^2+y^2+z^2+xy+yz+zx)=3a^2$

C) $2(x^2-y^2-z^2+xy+yz+zx)=a^2$

D) $2(x^2+y^2+z^2-xy-yz-zx)=3a^2$

Ans. D

42) The equation of the right circular cylinder whose axis is $x=2y=-z$ and radius 4 is...

A) $5x^2-8y^2+5z^2-4yz+8zx-4xy+144=0$

B) $5x^2-8y^2+5z^2-4yz+8zx-4xy-144=0$

C) $5x^2-8y^2-5z^2-4yz+8zx-4xy+144=0$

D) $5x^2+8y^2+5z^2+4yz+8zx-4xy-144=0$

Ans. D

43) The radius of right circular cylinder whose axis is $\frac{x}{2}=\frac{y}{1}=\frac{z}{2}$ and which passes through the point (1,2,1) is…

A) 2 B) $2\sqrt{2}$ C) $\sqrt{2}$ D) $\frac{1}{2}$

Ans. C

44) The equation of the right circular cylinder whose radius 5 and axis is the line $\frac{x-2}{2}=\frac{y-3}{1}=\frac{z+1}{1}$ is...

A) $(x-2)^2+(y-3)^2+(z+1)^2-\left\{\frac{2(x-2)+1(y-3)+1(z+1)}{\sqrt{6}}\right\}^2=25$

B) $(x+2)^2+(y+3)^2+(z+1)^2+\left\{\frac{2(x-1)+1(y-2)+1(z-3)}{3}\right\}^2=25$

C) $(x-2)^2+(y-3)^2+(z+1)^2+\left\{\frac{(x-1)+(y-2)+(z-3)}{3}\right\}^2=25$

D) None of these

Ans. A

45) The equation of right circular cylinder whose axis is $\frac{x-2}{2}=\frac{y-1}{1}=\frac{z}{3}$ and radius $\sqrt{\frac{90}{7}}$ is…

A) $10x^2+13y^2+5z^2-4xy-6yz-12zx-36x-18y+30z-135=0$

B) $10x^2+13y^2+5z^2+4xy+6yz+12zx-36x-18y+30z-135=0$

C) $10x^2+13y^2+5z^2-4xy-6yz-12zx-36x-18y+30z+135=0$

D) None of these

Ans. A

46) The axis of right circular cylinder has direction cosines proportional to 2,3,6. The direction ratios of axis are..

A) $\frac{-2}{7},\frac{-3}{7},\frac{-6}{7}$ B) $\frac{2}{7},\frac{3}{7},\frac{6}{7}$ C) $\frac{-2}{49},\frac{-3}{49},\frac{-6}{49}$ D) $\frac{-2}{7},\frac{3}{7},\frac{-6}{7}$

Ans. B

47) The equation of right circular cylinder of radius 2 whose axis passes through (1,2,3) and has direction cosines proportional to 2,-3,6 is…

A) $(x-1)^2+(y-2)^2+(z+1)^2-\left\{\frac{2(x-2)+1(y-3)+1(z+1)}{\sqrt{6}}\right\}^2=4$

B) $(x-2)^2+(y-3)^2+(z+1)^2+\left\{\frac{2(x-2)+1(y-3)+1(z+1)}{\sqrt{6}}\right\}^2=4$

C) $(x-1)^2+(y-2)^2+(z-3)^2-\left\{\frac{2x-3y+6z-14}{7}\right\}^2=4$

D) $(x-1)^2+(y-2)^2+(z-3)^2+\left\{\frac{2x-3y+6z-14}{7}\right\}^2=4$

Ans. C

Multiple Choice Questions
Engineering Mathematics - II
Unit I: Differential Equations

Multiple Choice Questions:

Type: Variable Separable Differential Equations and Reducible to Variable Separable Form

1	The solution of differential equation is $\frac{dy}{dx}=e^{x-y}+3x^2e^{-y}$
A	$e^y=e^x+x^3+C$
B	$e^y=e^x+3x^3+C$
C	$e^y=e^x+3x+C$
D	$e^x+e^y=3x^3+C$
Ans	**A**
Marks	**1**
Unit	**Ib**

2	The solution of differential equation is $x^3\left(x\frac{dy}{dx}+y\right)-\sec(xy)=0$ by substitution $xy=u$ is
A	$\tan(xy)+\frac{1}{2x^2}=C$
B	$\sin(xy)+\frac{1}{2x^2}=C$
C	$\sin(xy)-\frac{1}{2x^2}=C$
D	$\sin(xy)-\frac{1}{4x^4}=C$
Ans	**B**
Marks	**1**
Unit	**Ib**

3	The solution of differential equation $x\left(1+y^2\right)dx+y\left(1+x^2\right)dy=0$ is

A	$\left(1-x^2\right)\left(1+y^2\right)=C$
B	$\tan^{-1}x+\tan^{-1}y=C$
C	$\left(1+x^2\right)=C\left(1+y^2\right)$
D	$\left(1+x^2\right)\left(1+y^2\right)=C$
Ans	**D**
Marks	**1**
Unit	**Ib**

4	The solution of differential equation $e^{xy}(xdy+ydx)-\tan x\,dx-sec^2y\,dy=0$ is
A	$e^{xy}\left(\frac{x^2}{2}+\frac{y^2}{2}\right)-\log\ \text{secx}-\log\text{tany}=\text{C}$
B	$e^{xy}(xy)-\log\ \text{secx}-\log\text{tany}=\text{C}$
C	$e^{xy}-\log\ \text{secx}-\log\text{tany}=\text{C}$
D	$e^{xy}\left(\frac{x^2}{2}-\frac{y^2}{2}\right)-\log\ \text{secx}-\log\text{tany}=\text{C}$
Ans	**C**
Marks	**1**
Unit	**Ib**

5	By the substitution $y=ux$ the solution of differential equation $x\frac{dy}{dx}=y(\log\frac{y}{x}+1)$
A	$\log\left[\log\left(\frac{y}{x}\right)\right]-x=C$
B	$\log\frac{\text{y}}{\text{x}}-x=C$
C	$\log\frac{\text{x}}{\text{y}}-x=C$
D	$\log\left[\log\left(\frac{y}{x}\right)\right]+x=C$
Ans	**A**
Marks	**1**

Unit	**Ib**

6	The general solution of the differential equation $(1+x^2)dy+(1+y^2)dx=0$ is
A	$\frac{x-y}{1+xy}=C$
B	$\frac{x+y}{1+xy}=C$
C	$\frac{x+y}{1-xy}=C$
D	$\frac{x-y}{x+y}=C$
Ans	**C**
Marks	**1**
Unit	**Ib**

7	The general solution of the differential equation is $x^3\,\frac{dy}{dx}=\sec y$ is
A	$\sin y+\frac{1}{x^2}=C$
B	$\cos y+\frac{1}{x^2}=C$
C	$\sin y-\frac{1}{x^2}=C$
D	$\sin y+\frac{1}{2x^2}=C$
Ans	**D**
Marks	**1**
Unit	**Ib**

8	The general solution of the differential equation $\cos x(e^y+1)dx=-e^y\sin x\,dy$ is
A	$(e^y+1)\sin x=C$
B	$(e^y+1)\cos x=C$
C	$\frac{e^y+1}{\sin x}=C$
D	$(e^{-y}-1)\tan x=C$

Ans	**A**
Marks	**1**
Unit	**Ib**

9	By the substitution $u = 4x + y + 1$ the solution of the differential equation $\frac{dy}{dx} = (4x + y + 1)^2$ is
A	$log(4x + y + 1) - 2x = C$
B	$tan^{-1}(4x + y + 1) - 2x = C$
C	$tan^{-1}(4x + y + 1) + 2x = C$
D	$(4x + y + 1) - 2x = C$
Ans	**B**
Marks	**1**
Unit	**Ib**

10	The general solution of the differential equation $\frac{dy}{dx} = \frac{(xy+y)}{(xy+x)}$
A	$x - y = log\left(C\frac{x}{y}\right)$
B	$y - x = log\left(C\frac{x}{y}\right)$
C	$x^2 - y^2 = log\left(C\frac{x}{y}\right)$
D	$\frac{y^2}{2} - \frac{x^2}{2} + y + x = C$
Ans	**B**
Marks	**1**
Unit	**Ib**

11	The general solution of the differential equation $\left[\frac{(x^2+e^x)}{y}\right]\frac{dx}{dy} + 1 = 0$
A	$\frac{x^3}{3} + e^x + \frac{y^2}{2} = C$
B	$\frac{x^3}{3} - e^x - \frac{y^2}{2} = C$

C	$\frac{x^3}{3}+\frac{y^2}{2}=C$
D	None of the above
Ans	**A**
Marks	**1**
Unit	**Ib**

12	The general solution of the differential equation $sec^2x\ \tan y\ dx + sec^2y \tan x\ dy = 0$ is
A	$tanx + tany = C$
B	$\frac{tanx}{tany} = C$
C	$tanx - tany = C$
D	$tanx\ tany = C$
Ans	**D**
Marks	**1**
Unit	**Ib**

Type: Exact Differential Equations and Reducible to Exact

13	The differential equation $\left(\frac{2x}{y^3}\right)dx+\left(\frac{y^2+ax^2}{y^4}\right)dy=0$ is exact if			**[1]**
A	$a=-3$	B	$a=3$	
C	$a=-2$	D	$a=6$	
Ans	**A**			

14	Integrating factor of homogeneous differential equation $\left(xy-2y^2\right)dx+\left(3xy-x^2\right)dy=0$ is	**[1]**

A	$\frac{1}{xy}$	B	$\frac{1}{x^2y^2}$	
C	$\frac{1}{x^2y}$	D	$\frac{1}{xy^2}$	
Ans	**D**			

15	Integrating factor for differential equation $(2x\log x - xy)dy + (2y)dx = 0$ is			**[1]**
A	$\frac{1}{x}$	B	$\frac{1}{x^2y^2}$	
C	$\frac{1}{x^2}$	D	$\frac{1}{y}$	
Ans	**A**			

16	Solution of non exact differential equation $y(2xy + e^x)dx - e^x dy = 0$ with integrating factor $\frac{1}{y^2}$ is			**[1]**
A	$x^2 + \frac{e^x}{y} - e^x \log y = C$	B	$x^2 + \frac{e^x}{y} = C$	
C	$x^2 + \frac{2e^x}{y} = C$	D	$x^2 - \frac{e^x}{y} = C$	
Ans	**B**			

17	Solution of non exact differential equation $(x^4e^x - 2mxy^2)dx + (2mx^2y)dy = 0$ with integrating factor $\frac{1}{x^4}$ is			**[1]**
A	$e^x + \frac{6my^2}{x^4} = C$	B	$e^x + \frac{2my^2}{x^2} = C$	
C	$e^x + \frac{y^2}{x^2} = C$	D	$e^x + \frac{my^2}{x^2} = C$	
Ans	**D**			

18	The general solution of the differential equation $\frac{dy}{dx} = \frac{e^{2x} - 3y}{3x - e^{2y}}$ is			**[1]**
A	$e^{2x} - 6xy + e^{2y} = C$	B	$e^{2x} + 6xy + e^{2y} = C$	

C	$e^{2x} - 6xy - e^{2y} = C$	D	$e^{2x} - 3\frac{y}{2} + e^{2y} = C$	
Ans	**A**			

19	The general solution of the differential equation $y\,dx = (\sin y - x)dy$ is			**[1]**
A	$xy - \cos y = C$	B	$xy + \cos y = C$	
C	$\cos x - xy = C$	D	$\frac{y^2}{2} - \cos y + \frac{x^2}{2} = C$	
Ans	**B**			

20	Integrating factor for differential equation $y(1+xy)\,dx + x(1+xy+x^2y^2)dy = 0$ is			**[1]**
A	$\frac{1}{x^3y^3}$	B	$\frac{-1}{x^2y^2}$	
C	$\frac{-1}{x^3y^3}$	D	$\frac{1}{xy}$	
Ans	**C**			

21	The integrating factor of non exact differential equation $(x^2 + y^2 + x)\,dx + xy\,dy = o$ is			**[1]**
A	$-x$	B	$\frac{1}{x}$	
C	$\frac{-1}{x^2}$	D	x	
Ans	**D**			

22	Solution of non exact differential equation $(x^2y - 2xy^2)\,dx - (x^3 - 3x^2y)\,dy = 0$ with integrating factor $\frac{1}{x^2y^2}$ is			**[1]**
A	$\frac{x}{y} - 2\log x + 3\log y = C$	B	$\frac{x}{y} + 2\log x + 3\log y = C$	
C	$\frac{x}{y} + 2\log x - 3\log y = C$	D	$y - 2\log x - 3\log y = C$	
Ans	**A**			

23	The general solution of the differential equation $(x^3 + 3xy^2)\,dx + (y^3 + 3x^2y)\,dy = 0$ is			**[1]**
A	$x^4 + 6x^2y^2 + y^4 = C$	B	$x^4 - 6x^2y^2 - y^4 = C$	
C	$3x^2 + 6xy + 3y^2 = C$	D	$3x^2 - 6xy + 3y^2 + 3x^2 = C$	
Ans	**A**			

24	If $\frac{1}{y^3}$ is the integrating factor of non exact differential equation $(y^4 + 2y)dx + (xy^3 - 4x)dy = 0$ then its general solution is			**[1]**
A	$xy + \frac{2x}{y^2} + y^2 = C$	B	$xy - \frac{2x}{y^2} = C$	
C	$xy + \frac{2x}{y^2} = C$	D	$xy - \frac{2x}{y^2} - y^2 = C$	
Ans	**D**			

25	If $\frac{1}{y}$ is the integrating factor of non exact differential equation $(y\log y)dx + (x - logy)dy = 0$ then its general solution is			**[1]**
A	$2x\ log\ y - xsiny = C$	B	$2x\ log\ y - cosy = C$	
C	$2x\ log\ y + xsiny = C$	D	$x\ log\ y - siny = C$	
Ans	**A**			

Sinhgad College of Engineering,Vadgaon

Engineering Mathematics – II

Unit 6-Multiple integrals and their applications

Q.1) The value of $\int_0^{\frac{\pi}{2}} \int_0^{\frac{\pi}{2}} \sin x \, dx \, dy$ is

A)0

B)1

C)$\frac{\pi}{2}$

D)π

Ans-C

Q.2) The value of $\int_0^{\frac{\pi}{2}} \int_0^{\frac{\pi}{2}} \cos x \, dx \, dy$ is

A)$\frac{\pi}{2}$

B)1

C)0

D)π

Ans-A

Q.3) The value of $\int_0^1 \int_0^y x\, dx\, dy$ is

A)$\frac{1}{2}$

B)$\frac{1}{3}$

C)$\frac{1}{8}$

D)$\frac{1}{6}$

Ans-D

Q.4) The value of $\int_0^1 \int_0^x e^y\, dx\, dy$ is

A)e^2

B)$e - 2$

C)e

D)$\frac{1}{2}(e^2 - 1)$

Ans: B

Q.5)Using polar transformation $x = r\cos\theta$, $y = r\sin\theta$ the Cartesian double integral $\iint_R f(x,y)dxdy$ becomes

A) $\iint_R f(r,\theta)drd\theta$

B) $\iint_R f(r,\theta)rdrd\theta$

C) $\iint_R f(r,\theta)r^2drd\theta$

D) $\iint_R f(r,\theta)\theta drd\theta$

Ans:B

Q.6) On changing the order of integration of $\int_0^1\int_0^x f(x.y)dxdy$ becomes

A) $\int_0^1\int_0^1 f(x.y)dxdy$

B) $\int_0^1\int_0^y f(x.y)dxdy$

C) $\int_0^1\int_1^y f(x.y)dxdy$

D) $\int_0^1\int_y^1 f(x.y)dxdy$

Ans: D

Q.7) On changing the order of integration of $\int_0^1\int_{x^2}^1 f(x.y)dxdy$ becomes

A) $\int_0^1\int_0^{\sqrt{y}} f(x.y)dxdy$

B) $\int_0^1\int_0^{-\sqrt{y}} f(x.y)dxdy$

C) $\int_0^1\int_0^{\sqrt{x}} f(x.y)dxdy$

D) $\int_0^1\int_0^{-\sqrt{x}} f(x.y)dxdy$

Ans: A

Q.8) on transforming into the polar co-ordinates the double integration $\int_0^1 \int_0^{\sqrt{1-x^2}} f(x.y)dxdy$ becomes

A) $\int_0^{\pi} \left\{ \int_0^1 f(r,\theta) r dr \right\} d\theta$

B) $\int_0^{\frac{\pi}{2}} \left\{ \int_0^1 f(r,\theta) r d\theta \right\} dr$

C) $\int_0^{\frac{\pi}{2}} \left\{ \int_0^1 f(r,\theta) r dr \right\} d\theta$

D) $\int_0^{2\pi} \left\{ \int_0^1 f(r,\theta) r dr \right\} d\theta$

Ans: C

Q.11) on transforming into the polar co-ordinates the double integration $\int_0^a \int_0^{\sqrt{a^2-y^2}} e^{-x^2-y^2} dxdy$ becomes

A) $\int_0^{\frac{\pi}{2}} \int_0^a e^{-r^2} dr d\theta$

B) $\int_0^{\frac{\pi}{2}} \int_0^a e^{-r^2} r^2 dr d\theta$

C) $\int_0^{\frac{\pi}{2}} \int_0^a e^{-r^2} r dr d\theta$

D) $\int_0^{\frac{\pi}{2}} \int_0^a e^{-r} r dr d\theta$

Ans. C

Q.12)To find the area of upper half of a cardioid $r = a(1 + \cos\theta)$ the double integral becomes

A) $\int_0^{\pi} \int_0^{a(1+\cos\theta)} r dr d\theta$

B) $\int_0^{\pi} \int_0^{a(1+\cos\theta)} dr d\theta$

C) $\int_0^{2\pi} \int_0^{a(1+\cos\theta)} r^2 dr d\theta$

D) $\int_0^{2\pi} \int_0^{a(1+\cos\theta)} r dr d\theta$

Ans: A

13. The value of $\int_0^2 \int_0^x e^{x+y}\, dydx$ is

A) $\frac{1}{2}(e^2 - 1)$ B) $\frac{1}{2}(e^2 - e)$ C) $\frac{1}{2}(e^2 - 1)^2$ D) None of these

Ans. C

14. On changing the order of integration for $\int_0^\infty \int_x^\infty f(x,y)\,dydx$,the integral becomes

A) $\int_0^\infty \int_0^\infty f(x,y)\,dydx$ B) $\int_0^\infty \int_y^\infty f(x,y)\,dxdy$

C) $\int_0^\infty \int_0^y f(x,y)\,dxdy$ D) $\int_0^\infty \int_0^x f(x,y)\,dydx$

Ans. C

15. On changing the order of integration for $\int_0^a \int_{\frac{y^2}{a}}^{y} f(x,y)dxdy$,the integral becomes

A) $\int_0^a \int_0^x f(x,y)\,dxdy$ B) $\int_0^a \int_x^{\sqrt{ax}} f(x,y)\,dydx$

C) $\int_0^a \int_0^a f(x,y)\,dydx$ D) $\int_0^\infty \int_x^\infty f(x,y)\,dxdy$

Ans. B

16.Find the value of $\int_0^1 \int_0^{1-x}(x+y)dxdy$

A) $^1⁄_2$ B) $^1⁄_3$ C) $^1⁄_4$ D) $^1⁄_5$

Ans B

17. Evaluate $\int_0^1 \int_0^y xydxdy$

A) $^1⁄_2$ B) $^1⁄_3$ C) $^1⁄_4$ D) $^1⁄_8$

Ans D

18. Evaluate $\int_0^1 \int_0^1 \frac{dxdy}{(1+x^2)(1+y^2)}$

A) $\frac{\pi^2}{16}$ B) $\frac{5}{16}$ C) $1/16$ D) $1/8$

Ans A

19.Find the value of ∫∫xye^{x+y} dxdy.

A) ye^{y} (xe^{x}-e^{x}) B) (ye^{y}-e^{y})(xe^{x}-e^{x})

C) (ye^{y}-e^{y})xe^{x} D) (ye^{y}-e^{y})(xe^{x}+e^{x})

Ans B

20. using double integration and the strip parallel to X-axis the area enclosed between the curves $y^2 = 4x$ and $x^2 = 4y$ using points of cutting (0,0) and (4,4) is

A) $\int_0^4 \int_0^{4x} dxdy$ B) $\int_0^4 \int_0^4 dxdy$ C) $\int_0^{4y} \int_0^{4x} dxdy$ D) $\int_{y=0}^{y=4} \int_{\frac{y^2}{4}}^{2\sqrt{y}} dxdy$

Ans. D

21. The area enclosed between the straight line y=x and parabola $y = x^2$ in the XOY plane using double integration is

A) $\int_{x=0}^{x=1} \int_{y=x}^{y=x^2} dxdy$ B) $\int_{x=0}^{x=\infty} \int_{y=x}^{y=\infty} dxdy$

C) $\int_{x=0}^{x=1} \int_{y=0}^{y=1} dxdy$ D) $\int_{x=1}^{x=\infty} \int_{y=1}^{y=\infty} dxdy$

Ans. A

22. The area bounded by $y^2 = 4x$ and $2x - y - 4 = 0$ is

A) 2 B) 1 C) 8 D) 9

Ans. D

23. Area bounded by $y^2 = x$ and $x^2 = -8y$ is

A) $\frac{2}{3}$ B) $\frac{8}{3}$ C) $\frac{7}{3}$ D) $\frac{1}{3}$

Ans. B

24. Area bounded by $y^2 = 4ax$ and $x^2 = 4ay$ is

A) $\frac{a}{3}$ B) $\frac{a^2}{3}$ C) $\frac{16a^2}{3}$ D) $\frac{16}{3}$

Ans. C

25. Area bounded by $x^2 = 4y$ and $x - 2y + 4 = 0$ is

A) 9 B) 4 C) 16 D) 5

Ans. A

26. If $(\bar{x}, \bar{y})$ is centre of gravity of arc AB of the curve $y = f(x)$, then $(\bar{x}, \bar{y})$=

A) $\bar{x} = \frac{\int x\,\rho\, ds}{\int \rho\, ds}$; $\bar{y} = \frac{\int y\ \rho\, ds}{\int \rho\, ds}$.

B) $\bar{x} = \frac{\int y\,\rho\, ds}{\int \rho\, ds}$; $\bar{y} = \frac{\int x\,\rho\, ds}{\int \rho\, ds}$.

C) $\bar{x} = \frac{\int x^2\,\rho\, ds}{\int \rho\, ds}$; $\bar{y} = \frac{\int y^2 \rho\, ds}{\int \rho\, ds}$.

D) $\bar{x} = \frac{\int xy\,\rho\, ds}{\int \rho\, ds}$; $\bar{y} = \frac{\int y\ \rho\, ds}{\int \rho\, ds}$.

Ans. A

27. If $(\bar{x}, \bar{y})$ are corrdinates of centre of gravity of region R plane lamina bonded by curve C and ρ (density) is constant then $(\bar{x}, \bar{y})$=……….

A) $\bar{x} = \frac{\iint_R x\, dx\, dy}{\iint_R dx\, dy}$; $\bar{y} = \frac{\iint_R y\, dx\, dy}{\iint_R dx\, dy}$

B) $\bar{x} = \frac{\iint_R x^2\, dx\, dy}{\iint_R dx\, dy}$; $\bar{y} = \frac{\iint_R y\, dx\, dy}{\iint_R dx\, dy}$

C) $\bar{x} = \frac{\iint_R x\, dx\, dy}{\iint_R dx\, dy}$; $\bar{y} = \frac{\iint_R y^2\, dx\, dy}{\iint_R dx\, dy}$

D) $\bar{x} = \frac{\iint_R x^2\, dx\, dy}{\iint_R dx\, dy}$; $\bar{y} = \frac{\iint_R y^2\, dx\, dy}{\iint_R dx\, dy}$

Ans. A

28. The centroid of the loop of the curve $y^2 = \frac{x^2(a-x)}{(a+x)}$ will lie on …………

A) Y-axis

B) X- axis

C) origin

D) None of the above

Ans. B

29. The centroid of the area bounded by

$y^2(2a - x) = x^3$ and its asymptote is

A) $(\bar{x}, \bar{y}) = (\frac{5a}{3}, 2a)$

B) $(\bar{x}, \bar{y}) = (\frac{5a}{3}, a)$

C) $(\bar{x}, \bar{y}) = (\frac{5a}{3}, 0)$

D) $(\bar{x}, \bar{y}) = (\frac{5a}{3}, a)$

Ans. C

30. The centroid of the loop of the curve $x^2 = \frac{y^2(a-y)}{(a+y)}$ will lie on …………

A) Y-axis

B) X- axis

C) origin

D) None of the above

Ans. A

31. If ($\bar{x}$, $\bar{y}$, $\bar{z}$) be coordinates of centre of gravity of the solid which encloses volume V. then $\bar{x}$ =……

A) $\bar{x} = \frac{\iiint_V x\,\rho\, dx\, dy\, dz}{\iiint_V \rho\, dx\, dy\, dz}$;

B) $\bar{x} = \frac{\iiint_V y\,\rho\, dx\, dy\, dz}{\iiint_V \rho\, dx\, dy\, dz}$;

C) $\bar{x} = \frac{\iiint_V z\,\rho\, dx\, dy\, dz}{\iiint_V \rho\, dx\, dy\, dz}$z

D) $None\ of the\ above$

Ans.A

32. The Moment of inertia of a plane lamina R bounded by the curve C about X-axis is………… .

A) $\iint_R \rho\, y^2\, dx\, dy$ B) $\iint_R \rho\, x^2\, dx\, dy$

C) $\iint_R \rho\, (x+y)^2\, dx\, dy$ D) $\iint_R \rho\, x\, dx\, dy$

Ans.A

33. The Moment of inertia of a plane lamina R bounded by the curve C about Y-axis is………… .

A) $\iint_R \rho\, y^2\, dx\, dy$ B) $\iint_R \rho\, x^2\, dx\, dy$

C) $\iint_R \rho\, (x+y)^2\, dx\, dy$ D) $\iint_R \rho\, x\, dx\, dy$

Ans.B

34. The Moment of inertia of a plane lamina R bounded by the curve C in polar coordinates is

A) M.I. =$\iint_R \rho\, p^2 r\, d\theta\, dr$ B) M.I. =$\iint_R \rho\, p^2\, d\theta\, dr$

C) M.I. =$\iint_R \rho\, p\, r\, d\theta\, dr$ D) M.I. =$\iint_R \rho\, p^2 \theta\, d\theta\, dr$

Ans. A

35. The Moment of inertia of solid which is at a distance p from the axis is ……

A) $\iiint_V \rho\, p\, dx\, dy\, dz$ B) $\iiint_V \rho\, p^2\, dx\, dy\, dz$

C) $\iiint_V \rho\, dx\, dy\, dz$ D) $\iiint_V \rho\, p^3\, dx\, dy\, dz$

Ans.B

36. The Moment of inertia of solid about X-axis is ……

A) $\iiint_V \rho(y^2+z^2)dx\,dy\,dz$

B) $\iiint_V \rho(x^2+z^2)dx\,dy\,dz$

C) $\iiint_V \rho(y^2+x^2)dx\,dy\,dz$

D) $\iiint_V \rho\, x^2 dx\,dy\,dz$

Ans.A

37. The Moment of inertia of solid about Y -axis is ……

A) $\iiint_V \rho(y^2+z^2)dx\,dy\,dz$

B) $\iiint_V \rho(x^2+z^2)dx\,dy\,dz$

C) $\iiint_V \rho(y^2+x^2)dx\,dy\,dz$

D) $\iiint_V \rho\, x^2 dx\,dy\,dz$

Ans.B

38. The Moment of inertia of solid about Z-axis is ……

A) $\iiint_V \rho(y^2+z^2)dx\,dy\,dz$ s

B) $\iiint_V \rho(x^2+z^2)dx\,dy\,dz$

C) $\iiint_V \rho(y^2+x^2)dx\,dy\,dz$

D) $\iiint_V \rho\, x^2 dx\,dy\,dz$

Ans.C

39. The Moment of inertia about the line $\theta=\frac{\pi}{2}$ of the area enclosed by $r=a(1+cos\theta)$

A) M.I. = $\iint r^2 sin^2\theta\, r\, dr\, d\theta$

B) M.I. = $\iint r^2 cos^2\theta\, r\, dr\, d\theta$

C) M.I. = $\iint r^2 cos^2\theta\ \ dr\, d\theta$

D) M.I. = $\iint cos^2\theta\, r\, dr\, d\theta$

Ans.B

40. The Moment of Inertia about the X-axis of the area enclosed by the lines $x=0\,,\frac{x}{a}+\frac{y}{b}=1$ is

A) $\rho\int_{y=0}^{b}\int_0^{\frac{a}{b}(b-y)} x^2 dx\, dy$

B) $\rho\int_{y=0}^{b}\int_0^{\frac{a}{b}(b-y)} x\, dx\, dy$

C) $\rho\int_{y=0}^{b}\int_0^{\frac{a}{b}(b-y)} y^2 dx\, dy$

D) $\rho\int_{x=0}^{b}\int_{y=0}^{\frac{a}{b}(b-y)} y^2 dy\, dx$

Ans.C

41. The Moment of Inertia about the Y-axis of the area enclosed by the lines $x = 0, \frac{x}{a} + \frac{y}{b} = 1$ is

A) $\rho \int_{y=0}^{b} \cdot \int_{0}^{\frac{a}{b}(b-y)} x^2 dx\, dy$

B) $\rho \int_{y=0}^{b} \cdot \int_{0}^{\frac{a}{b}(b-y)} x\, dx\, dy$

C) $\rho \int_{y=0}^{b} \cdot \int_{0}^{\frac{a}{b}(b-y)} y^2 dx\, dy$

D) $\rho \int_{x=0}^{b} \cdot \int_{y=0}^{\frac{a}{b}(b-y)} y^2 dy\, dx$

Ans.A

42. Transformation of triple integration to spherical polar coordinates is

A) $\iiint_V F(r, \theta, \emptyset)\, r^2 sin\theta\, d\theta\, d\emptyset\, dr$

B) $\iiint_V F(r, \theta, z)\, r^2 sin\theta\, d\theta\, d\emptyset\, dr$

C) $\iiint_V F(r, \theta, \emptyset)\, sin\theta\, d\theta\, d\emptyset\, dr$

D) $\iiint_V F(r, \theta, \emptyset)\, r^2\, d\theta\, d\emptyset\, dr$

Answer : A

43. $\int_{-1}^{1} \int_{0}^{z} \int_{x-z}^{x+z} (x + y + z) dxdydz =$

A) 1 B) 0 C) -1 D) none of these

Answer : B

44. $\int_{0}^{1} dy \int_{y^2}^{1} dx \int_{0}^{1-x} xdz$

A) $-\frac{4}{35}$ B) $\frac{4}{35}$ C) $\frac{2}{35}$ D) $\frac{-2}{35}$

Answer : B

45. $\iiint (x^2 y^2 + y^2 z^2 + z^2 x^2) dxdydz$ throughout the volume of the sphere $x^2 + y^2 + z^2 = a^2$ is

A) $\frac{4}{35} a^7$ B) $\frac{-4}{35} a^7$ C) $\frac{4}{35} a^7 \pi$ D) $a^7 \pi$

Answer : C

46. $\iiint\limits_V \sqrt{1-\frac{x^2}{a^2}-\frac{y^2}{b^2}-\frac{z^2}{c^2}}\ dxdydz$ throughout the volume of the ellipsoid

$\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ is

A) $\frac{\pi^2 abc}{4}$ B) $\frac{\pi abc}{4}$ C) $\frac{abc}{4}$ D) $\frac{\pi^2}{4}$

Answer : A

47. $\int_0^a \int_0^x \int_0^{\sqrt{x+y}} z\ dxdydz =$

A) $\frac{-a^2}{4}$ B) $\frac{a}{4}$ C) $\frac{a^3}{4}$ D) $\frac{a^2}{4}$

Answer : C

48. $\iiint (x+y+z)\ dxdydz$ over the positive octant of the sphere

$x^2+y^2+z^2=a^2$ is

A) $\frac{-\pi a^4}{16}$ B) $\frac{3\pi a^4}{16}$ C) $\frac{3\pi a^2}{16}$ D) $\frac{\pi a^4}{6}$

Answer : B

49. The Dirichlet's theorem for 3 variables x, y, z is $\iiint x^{a-1}\ y^{b-1} z^{c-1} dxdydz$ =

A) $\frac{\Gamma a\ \Gamma b\ \Gamma c}{\Gamma 1+a-b+c}$ B) $\frac{\Gamma a\ \Gamma b\ \Gamma c}{\Gamma 1-a+b+c}$ C) $\frac{\Gamma a\ \Gamma b\ \Gamma c}{\Gamma 1+a+b+c}$ D) $\frac{\Gamma a\ \Gamma b\ \Gamma c}{\Gamma 1+a+b-c}$

Answer : C

50. The volume of the ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ is given by

$V = 8abc \int_0^{\pi/2} \int_0^{\pi/2} \int_0^1 r^2 sin\theta\ d\theta\ d\emptyset\ dr =$

A) $\frac{2abc}{3}$ B) $\frac{abc\pi}{3}$ C) $\frac{2abc}{3}$ D) $\frac{4abc}{3}$

Answer : D

51. The volume of the tetrahedron bounded by the co-ordinate planes and the

$\frac{x}{2}+\frac{y}{3}+\frac{z}{4}=1$ is

A) 2 B) 3 C) 4 D) 1

Answer : C

52. The volume enclosed by the cone $x^2+y^2=z^2$ and the paraboloid

$x^2+y^2=z$ given by $V=4\int_0^{\pi/2}\int_0^1(r-r^2)rd\theta dr=$

A) $\frac{\pi}{4}$ B) $\frac{\pi}{6}$ C) $\frac{\pi}{2}$ D) $-\frac{\pi}{4}$

Answer : B

53. The volume of the cylinder $x^2+y^2=2ax$ intercepted between paraboloid

$x^2+y^2=2az$ and XY plane is given by $V=\frac{1}{2a}2\int_0^{\pi/2}\int_0^{2acos\theta} r^2rd\theta dr=$

A) $\frac{3\pi}{4}$ B) $\frac{3\pi a^3}{4}$ c) $\frac{a^3\pi}{4}$ D) $\frac{3a^3}{4}$

Answer : B

Sinhgad College of Engineering,Vadgaon

Engineering Mathematics – II

Unit 4- Curve Tracing

1. If the powers of x in the Cartesian equation are even everywhere then the curve is symmetrical about

   A) x-axis B) y-axis C) both x and y axes D) line $y = x$

Ans.-B

2. If the powers of x and y both in the Cartesian equation are even everywhere then the curve is symmetrical about

   A) x-axis only B) y-axis only C) both x and y axes D) line $y = x$

Ans.- C

3. On replacing $x \; and \; y$ by $-x \; and -y$ respectively if the Cartesian equation remains unchanged then the curve is symmetrical about

   A) line $y = x$ B) y-axis C) both x and y axes D) opposite quadrants

Ans.- D

4. If x and y are interchanged and Cartesian equation remains unchanged then the curve is symmetrical about

   A) both x and y axes B) line $y = -x$ C) line $y = x$ D) opposite quadrants

Ans. - C

5. If the curve passes through origin then tangents at origin to the Cartesian curve can be obtained by equating to zero

   A) lowest degree term in the equation

   B) highest degree term in the equation

   C) coefficient of lowest degree term in the equation

   D) coefficient of highest degree term in the equation

Ans.- A

6. In Cartesian equation the points where $\frac{dy}{dx} = 0$, tangent to the curve at those points will be

   A) Parallel to y-axis B) Parallel to x-axis

   C) Parallel to $y = x$ D) Parallel to $y = -x$

Ans.- B

7. In Cartesian equation the points where $\frac{dy}{dx} = \infty$,tangent to the curve at those points will be

A) Parallel to $y = -x$ B) Parallel to x-axis

C) Parallel to y-axis D) Parallel to $y = x$

Ans.- C

8. If the powers of y in the Cartesian equation are even everywhere then the curve is symmetrical about

A) x-axis B) y-axis C) both $x$and y axes D) line $y = x$

Ans. - A

9. The asymptotes to the Cartesian curve parallel to x-axis if exists is obtained by equating to zero

A) Coefficient of highest degree term in y B) Lowest degree term in the equation

C) Coefficient of highest degree term in x D) Highest degree term in the equation

Ans. - C

10. The asymptotes to the Cartesian curve parallel to y-axis if exists is obtained by equating to zero

A) Coefficient of highest degree term in y B) Lowest degree term in the equation

C) Coefficient of highest degree term in x D) Highest degree term in the equation

Ans. – A

11. The curve represented by the equation $x^2y^2 = x^2 + 1$ is symmetrical about

A) $y = -x$ B) $x - axis\ only$ C) both x and y axes D) $y = x$

Ans. -C

12. The asymptote parallel to y-axis to the curve $xy^2 = a^2(a - x)$ is

A) $y = 0$ B) $x = 0$ C) $x = a$ D) $x = -a$

Ans. - B

13. The curve represented by the equation $y^2(2a - x) = x^3$ is

A) Symmetrical about y-axis and passing through origin

B) Symmetrical about x-axis and not passing through origin

C) Symmetrical about y-axis and passing through $(2a, 0)$

D) Symmetrical about x-axis and passing through origin

Ans. – D

14. The equation of tangents to the curve at origin if exist, represented by the equation

$3ay^2 = x(x-a)^2$ is

A) $x = a$ B) $x = 0\ and\ y = 0$ C) $x = 0$ D) $y = 0$

Ans. - C

15. The equation of asymptotes parallel to y-axis to the curve represented by the equation

$x^2y^2 = a^2(y^2 - x^2)$ is

A) $x = a\ , x = -a$ B) $y = a\ , y = -a$ C) $y = x\ , y = -x$ D) $x = 0\ , y = 0$

Ans. – A

16. The region of absence for the curve represented by the equation $x^2 = \frac{4a^2(2a-y)}{y}$ is

A) $y < 0\ and\ y > 2a$ B) $y > 0\ and\ y < 2a$

C) $y > 0\ and\ y > 2a$ D) $y < 0\ and\ y < 2a$

Ans. - A

17. The region of absence for the curve represented by the equation $xy^2 = a^2(a-x)$is

A) $x > 0\ and\ x < a$ B) $x < 0\ and\ x < a$ C) $x < 0\ and\ x > a$ D) $x > 0\ and\ x > a$

Ans. - C

18. The curve represented by the equation $r^2 = a^2cos2\theta$ is…

A) symmetric about θ =$\frac{\pi}{2}$ and not passing through pole

B) symmetric about θ =$\frac{\pi}{4}$ and not passing through pole

C) symmetric about initial line and pole

D) symmetric about θ =$\frac{\pi}{4}$ and passing through pole

Ans.-C

19. The curve represented by the equation $r^2 = a^2sin2\theta$ is…

A) symmetric about initial line and passing through pole
B) symmetric about initial line and pole
C) symmetric about θ =$\frac{\pi}{4}$ and not passing through pole
D) symmetric about θ =$\frac{\pi}{4}$ and passing through pole

Ans.- D

20. The curve represented by the equation $r = \frac{2a}{1+cos\theta}$ is

A) symmetric about initial line and passing through pole
B) symmetric about initial line and not passing through pole
C) symmetric about θ =$\frac{\pi}{4}$ and not passing through pole
D) symmetric about θ =$\frac{\pi}{4}$ and passing through pole

Ans.- B

21. If the polar equation to the curve remains unchanged by changing θ to – θ then the curve is symmetric about …

A) line θ = $\frac{\pi}{4}$ B) pole C) line θ = $\frac{\pi}{2}$ D) initial line θ = 0

Ans.- D

22. If the polar equation to the curve remains unchanged by changing θ to π– θ then the curve is symmetric about …

A) initial line θ = 0 B) pole
C) line passing through pole and perpendicular to the initial line
D) line θ = $\frac{\pi}{4}$

Ans. -C

23. Pole will lie on the curve if for some value of θ

A) r becomes zero B) r becomes infinite

C) r > 0 D) r < 0

Ans.- A

24. The tangents to the polar curve at pole if exist can be obtained by putting in the polar

A) θ = 0 B) θ = π C) r = 0 D) r = a, a> 0

Ans.- C

25. If the polar equation to the curve remains unchanged by changing $r\ to - r$ then the curve is symmetrical about

A) line $\theta = \frac{\pi}{4}$ B) pole C) line $\theta = \frac{\pi}{2}$ D) Initial line $\theta = 0$

Ans. - B

26. For the polar curve, angle φ between radius vector and tangent line is obtained by the formula

A) $cos\varphi = r\frac{d\theta}{dr}$ B) $tan\varphi = r\frac{d\theta}{dr}$ C) $tan\varphi = r\frac{dr}{d\theta}$ D) $sin\varphi = r\frac{d\theta}{dr}$

Ans. -B

27. The curve represented by equation $r = 2asin\theta$ is symmetrical about

A) Pole B) Initial line $\theta = 0$ C) Line $\theta = \frac{\pi}{4}$ D) Line $\theta = \frac{\pi}{2}$

Ans. – D

28. The curve represented by equation $r = a(1 + cos\theta)$ is symmetrical about

A) Initial line and passing through pole B) Initial line and not passing through pole

C) $\theta = \frac{\pi}{2}$ and passing through pole D) $\theta = \frac{\pi}{4}$ and passing through pole

Ans. – A

29. For the rose curve $r = a\cos n\theta$ and $r = a\sin n\theta$ if n is odd then the curve consists of

A) $2n$ equal loops B) $(n + 1)$ equal loops c) $(n - 1)$ equal loops D) n equal loops

Ans.- D

30. For the rose curve $r = a\cos n\theta$ and $r = a\sin n\theta$ if n is even then the curve consists of

A) $2n$ equal loops B) $(n + 1)$ equal loops c) $(n - 1)$ equal loops D) n equal loops

Ans.- A

31. The tangents at pole to the curve $r = a\sin 3\theta$ are

A) $\theta = 0, \frac{\pi}{3}, \frac{2\pi}{3}, \pi, \frac{4\pi}{3}, \frac{5\pi}{3} \ldots$ B) $\theta = \frac{\pi}{6}, \frac{3\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6} \ldots$

C) $\theta = 0, \frac{\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{4}, \ldots$ D) $\theta = 0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, \ldots$

Ans.- A

32. The tangents at pole to the curve $r = a\cos 2\theta$ are

A) $\theta = 0, \pi, 2\pi, 3\pi \ldots$ B) $\theta = \frac{\pi}{6}, \frac{3\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6} \ldots$

C) $\theta = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4} \ldots$ D) $\theta = 0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, \ldots$

Ans. – C

33. The Cartesian parametric curve $x = f\ (t),\ y = g(t)$ is symmetrical about X-axis if……..

A) f(t) is even and g(t) is odd B) f(t) is odd and g(t) is even

C) f(t) is even and g(t) is even D) f(t) is odd and g(t) is odd

Ans.- A

34. The Cartesian parametric curve $x = f\ (t),\ y = g(t)$ is symmetrical about Y-axis if……..

A) f(t) is even and g(t) is odd B) f(t) is odd and g(t) is even

C) f(t) is even and g(t) is even D) f(t) is odd and g(t) is odd

Ans.- B

35. The curve represented by the equation $x = at^2, y = 2at$ is symmetrical about .....

A) Y-axis B) X-axis C) both X and Y axis D) opposite quadrants

Ans.- B

36. The Cartesian parametric curve $x = f\ (t),\ y = g(t)$ is symmetrical in opposite quadrants if........

A) f(t) is even and g(t) is odd B) f(t) is odd and g(t) is even

C) f(t) is even and g(t) is even D) f(t) is odd and g(t) is odd

Ans. -D

37. The curve represented by the equation $x = t, y = t^3$ is symmetrical about .....

A) Y-axis B) X-axis C) both X and Y axis D) opposite quadrants

Ans.- D

38. The curve represented by the equation $x = a(\theta + sin\theta), y = a(1 + cos\theta)$ where θ is parameter is symmetrical about .....

A) Y-axis B) X-axis C) both X and Y axis D) opposite quadrants

Ans.-A

39. Formula for measuring the arc length AB where A(x_1, y_1), B(x_2, y_2) are any two points on the curve $y = f(x)$ is

A) $\int_{x_1}^{x_2} \sqrt{dx}$ B) $\int_{x_1}^{x_2} \sqrt{1 + (\frac{dy}{dx})^2}\, dx$ C) $\int_{x_1}^{x_2} \sqrt{1 + (\frac{dx}{dy})^2}\, dx$ D) $\int_{x_1}^{x_2} \sqrt{1 - (\frac{dy}{dx})^2}\, dx$

Ans.- B

40. Formula for measuring the arc length AB where A(x_1, y_1), B(x_2, y_2) are any two points on the curve $x = g(y)$ is

A) $\int_{y_1}^{y_2} \sqrt{dx}$ B) $\int_{y_1}^{y_2} \sqrt{1 + (\frac{dy}{dx})^2}\, dy$ C) $\int_{y_1}^{y_2} \sqrt{1 + (\frac{dx}{dy})^2}\, dy$ D) $\int_{y_1}^{y_2} \sqrt{1 - (\frac{dy}{dx})^2}\, dy$

Ans.- C

41. Formula for measuring the arc length AB where A(r_1, θ_1), B(r_2, θ_2) are any two points on the curve $r = f(\theta)$ is

A) $\int_{\theta_1}^{\theta_2} \sqrt{1 + (\frac{dr}{d\theta})^2} d\theta$ B) $\int_{\theta_1}^{\theta_2} \sqrt{1 + r^2 (\frac{d\theta}{dr})^2} d\theta$

C) $\int_{\theta_1}^{\theta_2} \sqrt{r^2 + (\frac{dr}{d\theta})^2} d\theta$ D) $\int_{\theta_1}^{\theta_2} \sqrt{r^2 + r^2 (\frac{dr}{d\theta})^2} dr$

Ans.- C

42. Formula for measuring the arc length AB where A(r_1, θ_1), B(r_2, θ_2) are any two points on the curve θ= $f(r)$ is θ

A)$\int_{r_1}^{r_2} \sqrt{r^2 + (\frac{dr}{d\theta})^2} dr$ B) $\int_{r_1}^{r_2} \sqrt{1 + (\frac{d\theta}{dr})^2} dr$

$C)$ $\int_{r_1}^{r_2} \sqrt{1 - r^2(\frac{d\theta}{dr})^2} dr$ D) $\int_{r_1}^{r_2} \sqrt{1 + r^2(\frac{d\theta}{dr})^2} dr$

Ans.- D

43. Formula for measuring the arc length AB where A, B are any two points on the parametric curve $x = f_1(t), y = f_2(t)$, corresponding to parameters t_1, t_2 respectively is…….

A) $\int_{t_1}^{t_2} \sqrt{(\frac{dx}{dt})^2 - (\frac{dy}{dt})^2} dt$ B) $\int_{t_1}^{t_2} \sqrt{(\frac{dx}{dt})^2 + (\frac{dy}{dt})^2} dt$

C) $\int_{t_1}^{t_2} \left[(\frac{dx}{dt})^2 - \left(\frac{dy}{dt}\right)^2 \right] dt$ $D)$ $\int_{t_1}^{t_2} \sqrt{(x^2(t) - y^2(t)} dt$

Ans. - B

44. The arc length AB where A(a, 0), B(0, a) are any two points on the circle $x^2 + y^2 = a^2$ using $1 + (\frac{dy}{dx})^2 = \frac{a^2}{a^2 - x^2}$ is …

A) $\frac{\pi a}{2}$ B) $a \, loga$ C) $\frac{\pi a}{4}$ D) a

Ans.- A

45. The length of arc of the curve $x = e^{\theta} cos\theta$, $y = e^{\theta} sin\theta$

from θ = 0 to θ =$\frac{\pi}{2}$ using $(\frac{dx}{d\theta})^2 + (\frac{dy}{d\theta})^2$ = 2$e^{2\theta}$ is……

A) $\sqrt{2}e^{\frac{\pi}{2}}$

B) $\sqrt{2}(e^{\frac{\pi}{2}} + 1)$

C) $\sqrt{2}(e^{\frac{\pi}{2}} - 1)$

D) $(e^{\frac{\pi}{2}} + 1)$

Ans.- C

46. Integral for calculating the length of upper arc of loop of the curve $9y^2$= $(x + 7)(x + 4)^2$ is………

A) $\int_{-7}^{-4} \sqrt{1 + (\frac{dy}{dx})^2} \, dx$

B) $\int_{7}^{4} \sqrt{1 + (\frac{dy}{dx})^2} \, dx$

C) $\int_{-7}^{0} \sqrt{1 + \left(\frac{dy}{dx}\right)^2} \, dx$

D) $\int_{0}^{-4} \sqrt{1 + (\frac{dy}{dx})^2} \, dx$

Ans.- A

47. Integral for calculating the length of arc of parabola $y^2 = 4x$ cut off by the line $3y = 8x$ is

A. $\int_0^{\frac{16}{9}} \sqrt{1+\left(\frac{dy}{dx}\right)^2}\, dx$

B. $\int_0^{\frac{9}{16}} \sqrt{1+(\frac{dy}{dx})^2}\, dx$

C. $\int_0^{\frac{8}{3}} \sqrt{1+\left(\frac{dy}{dx}\right)^2}\, dx$

D. $\int_0^{\frac{3}{8}} \sqrt{1+(\frac{dy}{dx})^2}\, dx$

Ans. - B

48. The length of arc of upper part of loop of the curve

$3y^2 = x(x-1)^2$ from (0,0) to (1 , 0) using

$1+(\frac{dy}{dx})^2 = \frac{(3x+1)^2}{12x}$ is....

A) $\frac{4}{\sqrt{3}}$

B) $\frac{1}{\sqrt{3}}$

C) $\frac{2}{\sqrt{3}}$

D) $\sqrt{3}$

Ans. - C

49. Integral for calculating the length of the upper arc of the loop of the curve $x = t^2, y = t(1-\frac{t^2}{3})$ is.......

A) $\int_0^9 \sqrt{(\frac{dx}{dt})^2 - (\frac{dy}{dt})^2}dt$

B) $\int_0^{\sqrt{3}} \sqrt{(\frac{dx}{dt})^2 + (\frac{dy}{dt})^2}dt$

C) $\int_0^1 \left[(\frac{dx}{dt})^2 - \left(\frac{dy}{dt}\right)^2\right] dt$

D) $\int_0^{\sqrt{3}} \sqrt{(x^2(t) - y^2(t)}dt$

Ans. - B

50. Integral for calculating the length of arc of Astroid $x = acos^3\theta, x = asin^3\theta$ in the first quadrant between two consecutive cusps is …….

A) $\int_0^{\frac{\pi}{4}} \sqrt{(\frac{dx}{d\theta})^2 + (\frac{dy}{d\theta})^2 d\theta}$

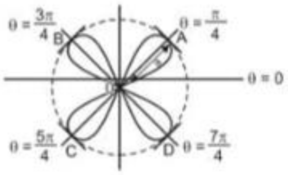
B) $\int_0^{\frac{\pi}{2}} \sqrt{(\frac{dx}{d\theta})^2 + (\frac{dy}{d\theta})^2 d\theta}$

C) $\int_0^{\frac{\pi}{3}} \sqrt{(\frac{dx}{d\theta})^2 + (\frac{dy}{d\theta})^2 d\theta}$

D) $\int_0^{\frac{\pi}{6}} \sqrt{(\frac{dx}{d\theta})^2 + (\frac{dy}{d\theta})^2 d\theta}$

Ans. – B

The following figure represents the curve whose equation is … (2)



(A) r = a cos 3θ

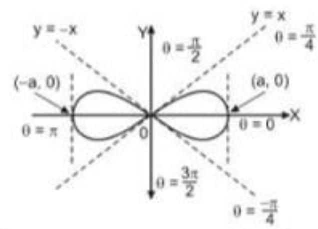
(B) r = a sin 2θ

(C) r = a sin 3θ

(D) r = a (1 + cos θ)

Ans.- B

The following figure represents the curve whose equation is … (2)



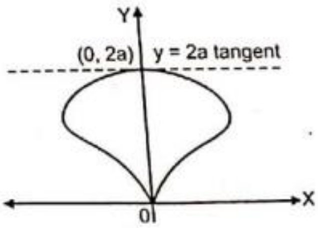
(A) $r^2 = a^2 \cos 2\theta$ (B) $r^2 = a^2 \sin 2\theta$

(C) $r = a \cos 2\theta$ (D) $r = a (1 + \cos \theta)$

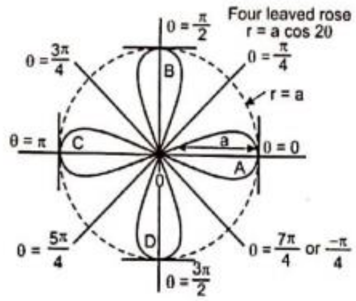
Ans.- A

The equation $r^2 = a^2 \cos 2\theta$ represents the curve …

(A)



(B)



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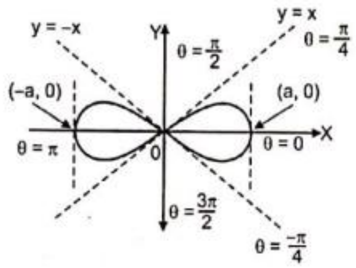

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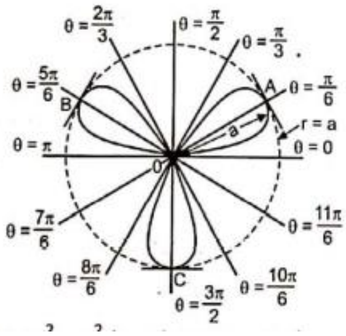
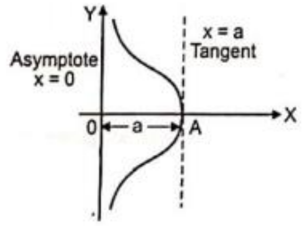


Ans.- C

The equation $xy^2 = a^2(a - x)$ represents the curve ...

(A)



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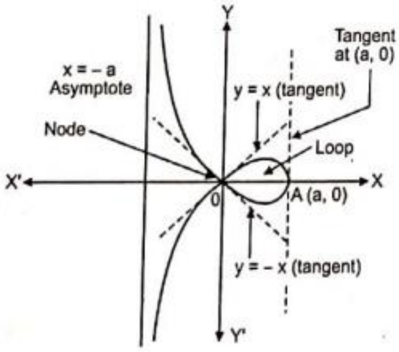
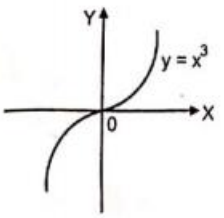
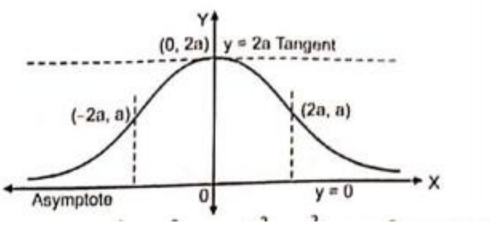


C)

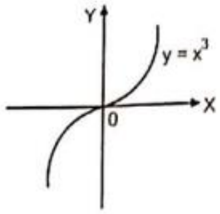




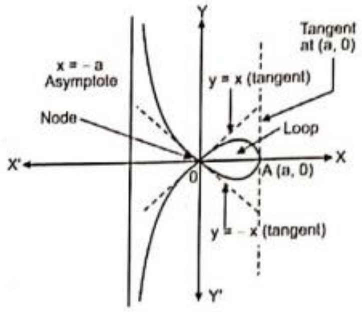
Ans.- A

The equation $x(x^2 + y^2) = a(x^2 - y^2)$, $a > 0$ represents the curve ... (2)

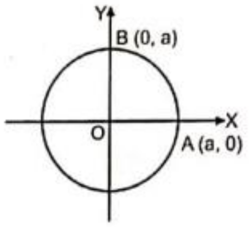
(A)



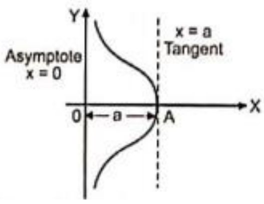
(B)



(C)



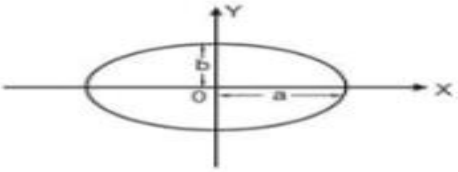
(D)



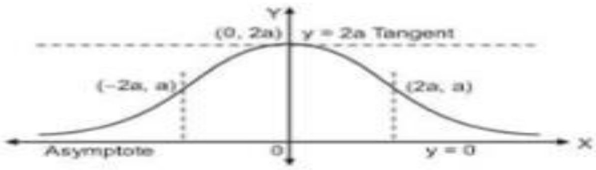
Ans.- B

The equation $a^2x^2 = y^3 (2a - y)$, $a > 0$ represents the curve ... (2

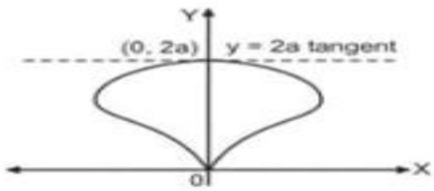
(A)



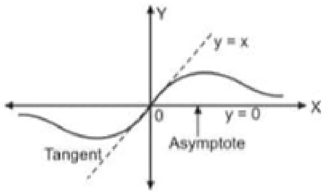
(B)



(C)



(D)



Ans.- C