DR.D.Y.PATIL INSTITUTE OF TECHNOLGY,PIMPRI,PUNE-18

DEPARTMENT OF MATHEMATICS

Question bank for In semester exam

Semester II (2021-2022)

SUB:ENGINEERING MATHEMATICS III

Unit 1

Linear Differential equation with constant coefficients

1. The solution of differential equation $\frac{d^3y}{dx^3}+y=0$ is

[A] $c_1e^x+e^x\left(c_2\cos\frac{\sqrt{3}}{2}x+c_3\sin\frac{\sqrt{3}}{2}x\right)$ [B] $c_1e^{-x}+e^{\frac{1}{2}x}\left(c_2\cos\frac{1}{2}x+c_3\sin\frac{1}{2}x\right)$

[C] $c_1e^{-x}+e^{\frac{1}{2}x}\left(c_2\cos\frac{\sqrt{3}}{2}x+c_3\sin\frac{\sqrt{3}}{2}x\right)$ [D] $\left(c_1+c_2x+c_3x^2\right)e^{-x}$

2. The solution of differential equation $\frac{d^3y}{dx^3}+3\frac{dy}{dx}=0$ is

[A] $c_1+c_2\cos x+c_3\sin x$ [B] $c_1+c_2\cos\sqrt{3}x+c_3\sin\sqrt{3}x$

[C] $c_1+c_2e^{\sqrt{3}x}+c_3e^{-\sqrt{3}x}$ [D] $c_1\cos x+c_2\sin x$

3. The solution of differential equation $\frac{d^3y}{dx^3}+\frac{d^2y}{dx^2}-2\frac{dy}{dx}+12y=0$ is

[A] $c_1e^{-3x}+e^x\left(c_2\cos\sqrt{3}x+c_3\sin\sqrt{3}x\right)$ [B] $c_1e^{-3x}+\left(c_2\cos 3x+c_3\sin 3x\right)$

[C] $c_1e^{3x}+e^{-x}\left(c_2\cos\sqrt{3}x+c_3\sin\sqrt{3}x\right)$ [D] $c_1e^{-x}+c_2e^{-\sqrt{3}x}+c_3e^{\sqrt{3}x}$

4. Particular Integral $\frac{1}{D+2}e^{-x}\cos e^x$, where $D\equiv\frac{d}{dx}$ is

[A] $e^{-x}\cos e^x$ [B] $e^{-x}\sin e^x$

[C] $e^{-2x}\cos e^{x}$ [D] $e^{-2x}\sin e^{x}$

5. Particular Integral $\frac{1}{D+2}e^{-2x}\sec^2 x(1+2\tan x)$, (use tanx =t) is

[A] $e^{-2x}\left(1+2\tan^2 x\right)$ [B] $e^{-2x}\left(\tan x+\tan^2 x\right)$

[C] $e^{2x}\left(\tan x+2\tan^2 x\right)$ [D] $e^{-2x}\left(\tan x+\sec x\right)$

6. Particular Integral $\frac{1}{D+1}\left(\frac{1}{1+e^{x}}\right)$ where $D\equiv\frac{d}{dx}$ is

[A] $e^{x}\log\left(1-e^{x}\right)$ [B] $\log\left(1+e^{x}\right)$

[C] $e^{x}\log\left(1+e^{x}\right)$ [D] $e^{-x}\log\left(1+e^{x}\right)$

7. Particular Integral of Differential equation $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+5y=10\sin x$ is

[A] $\frac{8}{3}\sin x$ [B] $\sin x-2\cos x$

[C] $4\sin x+2\cos x$ [D] $2\sin x+\cos x$

8. Particular Integral of Differential equation $\left(D^2-4D+4\right)y=e^{2x}x^4$ is

[A] $\frac{x^6}{120}e^{2x}$ [B] $\frac{x^6}{60}e^{2x}$

[C] $\frac{x^6}{30}e^{2x}$ [D] $\frac{x^5}{20}e^{2x}$

9. Particular Integral of Differential equation $\frac{d^2y}{dx^2}+2\frac{dy}{dx}+y=e^{-x}\cos x$ is

[A] $e^{x}\cos x$ [B] $-e^{-x}\sin x$

[C] $-e^{-x}\cos x$ [D] $\left(c_1x+c_2\right)e^{-x}$

10. In solving differential equation $\frac{d^2y}{dx^2}+9y=\frac{1}{1+\sin 3x}$ by method of variation of parameters, Complimentary function $=c_1\cos 3x+c_2\sin 3x$,
Particular Integral $=u\cos 3x+v\sin 3x$ then v is equal to

[A] $\frac{1}{3}\left(-\frac{1}{3}\sec 3x+\frac{1}{3}\tan 3x-x\right)$ [B] $-\frac{1}{9}\log\left(1+\sin 3x\right)$

[C] $\frac{1}{9}\log\left(1+\sin 3x\right)$ [D] $\frac{1}{3}\log\cos x$

11. In solving differential equation $\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$ by method of variation of parameters, Complimentary function $= c_1e^x + c_2e^{-x}$,
Particular Integral $= ue^x + ve^{-x}$ then v is equal to

[A] $e^{-x} - \log\left(1+e^{-x}\right)$ [B] $-\log\left(1+e^x\right)$

[C] $\log\left(1+e^x\right)$ [D] $-e^{-x} + \log\left(1+e^{-x}\right)$

12. In solving differential equation $\frac{d^2y}{dx^2} + 4y = 4\sec^2 2x$ by method of variation of Parameters, Complimentary function $= c_1 \cos 2x + c_2 \sin 2x$,

Particular Integral $= u\cos 2x + v\sin 2x$ then u is equal to

[A] $\log\left(\sec 2x + \tan 2x\right)$ [B] $-\sec 2x$

[C] $\sec 2x + \tan 2x$ [D] $-\left[\log\left(\sec x + \tan x\right)\right] + \sin x$

13.For the differential equation $x^2\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + 6y = x^5$, particular integral is given by

[A] $\frac{x^5}{6}$ [B] $\frac{x^5}{56}$

[C] $\frac{x^4}{6}$ [D] $-\frac{x^5}{44}$

14. For the differential equation $(2x+3)^2\frac{d^2y}{dx^2} - 2(2x+3)\frac{dy}{dx} - 12y = 6x,$ complimentary function is given by

[A] $c_1(2x+3)^3 + c_2(2x+3)^{-1}$ [B] $c_1(2x+3)^{-3} + c_2(2x+3)$

[C] $c_1(2x+3)^3 + c_2(2x+3)^2$ [D] $c_1(2x-3)^2 + c_2(2x-3)^{-1}$

15. For the differential equation $(3x+2)^2\frac{d^2y}{dx^2} + 3(3x+2)\frac{dy}{dx} - 36y = (3x+2)^2,$

Complimentary function is given by

[A] $c_1(3x+2)^3 + c_2(3x+2)^{-3}$

[B] $[c_1 \log(3x+2) + c_2](3x+2)^{-2}$

[C] $c_1(3x+2)^2 + c_2(3x+2)^{-2}$

[D] $c_1(3x-2)^2 + c_2(3x-2)^{-2}$

16. Particular Integral of differential equation $\frac{d^2y}{dx^2} - 7\frac{dy}{dx} + 6y = e^{2x}$ is

[A] $-\frac{xe^{2x}}{3}$

[B] $-\frac{e^{2x}}{4}$

[C] $\frac{e^{2x}}{4}$

[D] $\frac{e^{2x}}{24}$

17. Particular Integral of Differential equation $(D^2 - 5D + 6)y = 3e^{5x}$ is

[A] $\frac{e^{5x}}{2}$

[B] $\frac{e^{5x}}{6}$

[C] $-\frac{e^{5x}}{14}$

[D] $-\frac{e^{2x}}{2}$

18. Particular Integral of Differential equation $(D^2 - 9)y = e^{3x} + 1$ is

[A] $\frac{3x}{2}e^{3x} - \frac{1}{9}$

[B] $x\frac{e^{3x}}{6} + \frac{3}{8}$

[C] $x\frac{e^{3x}}{6} - \frac{1}{9}$

[D] $xe^{3x} + \frac{1}{8}$

19. For the simultaneous linear differential equations $\frac{dx}{dt} + y = e^t, \frac{dy}{dt} + x = e^{-t}$

solution of x using $D = \frac{d}{dt}$ is obtain from

[A] $(D^2+1)x = 2e^t$

[B] $(D^2-1)y = -e^t - e^{-t}$

[C] $(D^2+1)y = e^{-t} + e^t$

[D] $(D^2-1)x = e^t - e^{-t}$

20. For the simultaneous linear differential equations $\frac{du}{dx} + v = \sin x, \frac{dv}{dx} + u = \cos x$ solution

of u, using $D=\frac{d}{dx}$ is obtain from

[A] $(D^2+1)u=2\cos x$ [B] $(D^2-1)u=0$

[C] $(D^2-1)u=\sin x-\cos x$ [D] $(D^2-1)v=-2\sin x$

21. For the simultaneous linear differential equations $\frac{du}{dx}+v=\sin x, \frac{dv}{dx}+u=\cos x$, solution of v, using $D=\frac{d}{dx}$ is obtain from

[A] $(D^2+1)v=0$ [B] $(D^2-1)v=-2\sin x$

[C] $(D^2-1)u=0$ [D] $(D^2+1)u=\sin x+\cos x$

22. Particular Integral of Differential equation $\left(D^4-m^4\right)y=\cos mx$ is

[A] $\frac{-x}{4m^3}\cos mx$ [B] $\frac{x}{m^3}\sin mx$

[C] $-x\sin mx$ [D] $\frac{-x}{4m^3}\sin mx$

23. Particular Integral of Differential equation $\frac{d^3y}{dx^3}-4\frac{dy}{dx}=2\cosh 2x$ is

[A] $\frac{1}{4}\cosh 2x$ [B] $\frac{x}{8}\cosh 2x$

[C] $\frac{x}{4}\cosh 2x$ [D] $\frac{x}{4}\sinh 2x$

24. Particular Integral of Differential equation $\left(D^2+6D-9\right)y=\sinh 3x$ is

[A] $\frac{1}{18}\cosh 3x$ [B] $\frac{1}{2}\cosh 3x$

[C] $\frac{1}{18}\sinh 3x$ [D] $-\frac{1}{18}\cosh 3x$

25 In solving differential equation $\frac{d^2y}{dx^2}-6\frac{dy}{dx}+9y=\frac{e^{3x}}{x^2}$ by method of variation of parameters, Complimentary function $=c_1xe^{3x}+c_2e^{3x}$,

Particular Integral $=uxe^{3x}+ve^{3x}$ then u is equal to

[A] $-\frac{2}{x^3}$ [B] $\frac{1}{x}$

[C] $-\frac{1}{x}$ [D] $-\log x$

26 The solution of differential equation $\frac{d^3y}{dx^3}+2\frac{d^2y}{dx^2}+\frac{dy}{dx}=0$ is (2)

[A] $c_1+e^{-x}(c_{2x}+c_3)$ [B] $c_1+e^{x}(c_2x+c_3)$

[C] $e^{-x}(c_2x+c_3)$ [D] $c_1+c_2e^{x}+c_3e^{-x}$

27. In solving differential equation $\frac{d^2y}{dx^2}-y=e^{-x}\sin e^{-x}+\cos e^{-x}$ by Method of variation of Parameters, Complimentary function $c_1e^{x}+c_2e^{-x}$,

Particular Integral $=ue^{x}+ve^{-x}$ then v is equal to

[A] $\frac{1}{2}e^{-x}\sin e^{x}$ [B] $-\frac{1}{2}e^{x}\cos e^{-x}$

[C] $e^{x}e^{e^{x}}$ [D] $\frac{1}{2}e^{-x}\cos e^{x}$

28.In solving differential equation $\frac{d^2y}{dx^2}+y=\cos ecx$ by method of variation of parameters,

Complimentary function $=c_1\cos x+c_2\sin x,$ Particular Integral $=u\cos x+v\sin x$ then u is equal to

[A] $-\log\sin x$ [B] x [C] $-x$ [D] $\log\sin x$

29. The solution of differential equation $\frac{d^3y}{dx^3}+6\frac{d^2y}{dx^2}+11\frac{dy}{dx}+6y=0$ is

[A] $c_1e^{x}+c_2e^{2x}+c_3e^{3x}$ [B] $c_1e^{-x}+c_2e^{2x}+c_3e^{-3x}$

[C] $c_1e^{-x}+c_2e^{-2x}+c_3e^{-3x}$ [D] $c_1e^{x}+c_2e^{-2x}+c_3e^{3x}$

30The solution of differential equation $\frac{d^3y}{dx^3}-\frac{d^2y}{dx^2}+4\frac{dy}{dx}-4y=0$ is

[A] $(c_1 + c_2 x)e^{-2x} + c_3 e^{-x}$ [B] $c_1 e^{x} + c_2 \cos 4x + c_3 \sin 4x$

[C] $c_1 e^{x} + c_2 \cos 2x + c_3 \sin 2x$ [D] $c_1 e^{x} + c_2 e^{2x} + c_3 e^{-2x}$

31]The solution of differential equation $\frac{d^3y}{dx^3} - 7\frac{dy}{dx} - 6y = 0$ is (2)

[A] $c_1 e^{x} + c_2 e^{2x} + c_3 e^{3x}$ [B] $c_1 e^{-x} + c_2 e^{-2x} + c_3 3^{6x}$

[C] $c_1 e^{-x} + c_2 e^{2x} + c_3 e^{x}$ [D] $c_1 e^{-x} + c_2 e^{-2x} + c_3 e^{3x}$

32] . Particular Integral $\frac{1}{D+1}\sin e^{x}$, where $D \equiv \frac{d}{dx}$ is (2)

[A] $-e^{-x}\sin e^{x}$ [B] $e^{x}\cos e^{x}$

[C] $-e^{-x}\cos e^{x}$ [D] $e^{-x}\cos e^{x}$

33] . Particular Integral $\frac{1}{D+1}\left(\frac{1}{1+e^{x}}\right)$ where $D \equiv \frac{d}{dx}$ is (2)

[A] $e^{x}\log\left(1-e^{x}\right)$ [B] $\log\left(1+e^{x}\right)$

[C] $e^{x}\log\left(1+e^{x}\right)$ [D] $e^{-x}\log\left(1+e^{x}\right)$

34] . Particular Integral $\frac{1}{D+2}e^{-x}e^{e^{x}}$ where $D \equiv \frac{d}{dx}$ is

[A] $e^{2x}e^{e^{x}}$ [B] $e^{-2x}e^{e^{x}}$

[C] $e^{e^{x}}$ [D] $e^{-x}e^{e^{x}}$

35] Particular Integral of Differential equation $\left(D^2+1\right)y = \sin x$ is

[A] $-\frac{x}{2}\cos x$ [B] $-\frac{x}{4}\cos x$

[C] $-\frac{x}{2}\sin x$ [D] $-\frac{1}{2}\cos x$

36] Solution of symmetric simultaneous DE $\frac{dx}{x} = \frac{dy}{y} = \frac{dz}{z}$ is

(1)

A) $x = c_1 y, y = c_2 z$ B) $x - y = c_1 z, y - z = c_2 x$

C) $x+y=c_1, y+z=c_2$ D) $x+y=c_1, y-z=c_2$

37].Considering the first two ratio of the symmetrical simultaneous DE $\frac{dx}{y^2}=\frac{dy}{x^2}=\frac{dz}{x^2y^2z^2}$, one of the relation in the solution is DE is

A) $\frac{1}{x}-\frac{1}{y}=c$ B) $x-y=c$ c) $x^2-y^2=c$ D) $x^3-y^3=c$

38]Considering the first and third ratio of the symmetrical simultaneous DE $\frac{xdx}{y^3z}=\frac{dy}{x^2z}=\frac{dz}{y^3}$ one of the relation in the solution of DE is

A) $x^2-z^2=c$ B) $x^4-y^4=c$ C) $x^3-z^3=c$ D) $x-z=c$

39]Using a set of multiplier as 1,y,z the solution of DE $\frac{xdx}{z^2-2yz-y^2}=\frac{dy}{y+z}=\frac{dz}{y-z}$ is

A) $x^2+y^2+z^2=c$ B) $x+\frac{y^2}{2}+\frac{z^2}{2}=c$ C) $x+y+z=c$ D) $x+y^2+z^2=c$

40] Using a set of multiplier as x,y,z the solution of DE $\frac{dx}{3z-4y}=\frac{dy}{4x-2z}=\frac{dz}{2y-3x}$ is (2)

A) $x^3+y^3+z^3=c$ B) $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=c$ C) $x+y+z=c$ D) $x^2+y^2+z^2=c$

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