Registration No.: 11713132 **Paper Code: B**

COURSE CODE : MTH166
COURSE TITLE : DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Time Allowed: 01 hr ***Max.Marks: 40***

Read the following instructions carefully before attempting the question paper.

1. *Match the Paper Code shaded on the OMR Sheet with the Paper code mentioned on the question paper and ensure that both are the same.*
2. *This paper contains 40 questions of 1 mark each. 0.25 marks will be deducted for each wrong answer.*
3. *Do not write or mark anything on the question paper except your registration no. on the designated space.*
4. *Submit the question paper and the rough sheet(s) along with the OMR sheet to the invigilator before leaving the examination hall.*

Q1. The general solution of the equation $y'' - 5y' + 9y = \sin 3x$ is

(a) $y = Ae^{-x} + Be^{-4x} + 15\cos 2x$

(b) $y = Ae^{x} + Be^{4x} + 15\sin 2x$

(c) $y = Ae^{-x} + Be^{-x} + 15\sin 2x$

(d) $y = Ae^{x} + Be^{4x} + \frac{1}{15}\cos 2x$

Q2. The P.I. of the differential equation $(D^3 + 6D + 9)y = 5e^{-x}$ is

(a) $\frac{e^{-x}}{2}$

(b) $\frac{5e^{-x}}{2}$

(c) $-\frac{e^{-x}}{2}$

(d) $-\frac{5e^{-x}}{2}$

Q3. The trial solution for finding the P.I. of the differential equation $(D^2 + 3D + 1)y = x^2 + 1$

(a) $C_0 + C_1 x$

(b) $C_0 + C_1 x + C_3 x$

(c) $C_0 + C_1 x + C_3 x^2$

(d) $C_0 x + C_1 x^2 + Cx^3$

Q4. The general solution of the equation $y'' + 16y = x^2$ is

(a) A cos x + B sin x + $4x^2$

(b) A cos 4x + B sin 4x + $4x^2 - \frac{1}{2}$

(c) A cos 4x + B sin 4x + 4x

(d) None of these

Q5. Particular integral solution of $(2D^3 - 3D^2 + 5)y = 6e^{3x}$ will be

(a) $e^x/6$ (b) $3e^x/16$ (c) $6e^x$ (d) $e^x/32$

Q6. Solution of differential equation $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} = 0$ is

(a) $c_1 x + c_2$ (b) $c_1 \log x + c_2$ (c) $c_1 x^2 + c_2$ (d) $c_1 + \frac{c_2}{x}$

Q7. The roots of the Auxilary equation of the differential equation $2x^2y'' + 3xy' - 3y = 0$, are

(a) 1,-3/2 (b) -1,3/2 (c) -1,-3/2 (d) 1,3/2

Q8. The Particular Integral of $\frac{d^2y}{dx^2} + y = \sin x$, *is*

(a) $-\frac{x}{2}\sin x$ (b) $\frac{x}{2}\sin x$ (c) $\frac{x}{2}\cos x$ (d) $-\frac{x}{2}\cos x$

Q9. The general solution of the differential equation $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 3y = 0$, is

(a) $y = c_1x + c_2x^3$ (b) $y = c_1x - c_2x^3$ (c) $y = c_1x + c_2x^2$ (d) $y = c_1 + c_2x^3$

Q10. The operator form of the differential equation $\frac{dy_1}{dt} + \frac{dy_2}{dt} - 2y_1 + 3y_2 = t$ is

(a) $Dy_1+Dy_2+2y_1+3y_2=t$ (b) $Dy_1+Dy_2-2y_1+3y_2=t$

(c) $Dy_1+Dy_2-2y_1-3y_2=t$ (d) None of these

Q11. The complementary function differential of the equation $(D^2 - 2D + 5)^2y = 0$ *is*

(a)$e^x(Acos2x + Bsin2x)$ (b)$e^x\{(A + Bx)cos2x + (C + Dx)sin2x\}$

(c)$e^x(Acos2x + Bsin2x)+e^x(Ccos2x + Dsin2x)$ (d) None of these

Q12. The general solution of the differential equation $y'' - 10y' + 25y = 0$ is

(a) $y = c_1e^{4x} + c_1e^{5x}$

(b) $y = c_1e^{-5x} + c_1e^{-5x}$

(c) $y = c_1e^{5x} + c_1xe^{5x}$

(d) $y = c_1e^{4x} + c_1e^{7x}$

Q13. e^{2x}, xe^{2x} are solutions of which differential equation?

(a)$y'' + 2y' + y = 0$ (b)$y'' + 2y' + y = 0$ (c)$y'' - y' + y = 0$ (d) None of these

Q14. The complementary function of is $(D^2 - a^2)y = 0$ is

(a) $y = c_1e^{ax} + c_2e^{-ax}$ (b) $y = (c_1x + c_2)e^{ax}$ (c) $y = c_1\cos ax + c_2\sin ax$ (d) None of these

Q15. The Wronskian of the functions 1, $\sin x$, $\cos x$ is

(a) -1

(b) 1

(c) 0

(d) None of these

Q16. The solution of the differential equaltion $\frac{d^3y}{dx^3} - 2\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$,is

(a) $y = c_1e^x + c_2e^{2x} + c_3e^{3x}$ (b) $y = c_1e^x + c_2e^{-2x} + c_3e^{3x}$

(c)$y = c_1e^{-x} + c_2e^{2x} + c_3e^{3x}$ (d) $y = c_1e^x + c_2e^{2x} + c_3e^{-3x}$

Q17. The Particular Integral (P.I.) for the differential equation $y'' + y' - 6y = 5e^{-3x}$ is:

(a)$-e^{-3x}$ (b)$-xe^{-3x}$ (c)xe^{-3x} (d)e^{-3x}

Q18. By method of undetermined coefficient , the choice of particular integral for $y''-4y = 5e^{-2x}$ is

(a) Ce^{-2x} (b) Cxe^{-2x}

(c) Cx^2e^{-2x} (d) Cx^3e^{-2x}

Q19. To transform $xy'' + y' = \frac{1}{x}$ into a linear differential equations with constant coefficient, suitable transformation of x is

(a) $x = \sin t$ (b) $x = \log t$ (c) $x = e^t$ (d) none of these

Q20. Which of the following is Euler Cauchy equation?

(a) $x^2y''-5xy'+13y=30xy^2$

(b) $x^2y''-5xy'+13xy=30x^2$

(c) $x^2y''-5xy'+13y=30xy^2$

(d) None of these

Q21. The general solution of differential equation $p = \log(px - y)$ where $p = \frac{dy}{dx}$ is given by

(a) $y = cx - e^c$ (b) $y = 2c^2 + cx$ (c) $y = cx + \frac{2}{c}$ (d) none of these

Q22. Which of the following is Clairaut's differential equation ?

(a) $p^2 - 3p + 2 = 0$ (b) $y = px + p - p^3$ (c) $y = px^2 + \frac{p}{p-1}$ (d) none of these

Q23. In the non- exact differential equation $M(x,y)dx + N(x,y)dy = 0$ if $\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y} = Mf(y)$ then the integrating factor is given by

(a) $\frac{1}{f(y)}$ (b) $e^{f(y)}$ (c) $f(y)$ (d) $e^{\int f(y)dy}$

Q24. If e^x , e^{4x} are the solution of differential equation of the form $y'' + a(x)y' + b(x)y = 0$ .Then the value of $a(x)$ and $b(x)$ are

(a) $a(x) = -5$ and $b(x) = 4$
(b) $a(x) = 5$ and $b(x) = 4$
(c) $a(x) = -5$ and $b(x) - 4$
(d) $a(x) = 5$ and $b(x) = -4$

Q25. The second order linear homogeneous differential equation with variable coefficients is

(a) $y'' + 9y' + y = \log(x^2 - 9)$ (b) $(1+x^2)y'' + 2xy' + y = 0$
(c) $(1+x^2)y'' + 2xy' + y = x^2$ (d) $(1+x^2)y'' + 2yy' + 3y = 0$

Q26. The intervals on which the differential equation $y' = 3\frac{y}{x}$ is normal are

(a) any subinterval on $(-\infty, 0), (0, \infty)$ (b) any subinterval on $(-\infty, \infty)$
(c) any subinterval on $(-\infty, 1), (1, \infty)$ (d) none of these

Q27. If $y = e^{at}$ is solution of $\frac{d^2y}{dt^2} - 5\frac{dy}{dt} + 4y = 0$, then possible value of a is

(a) 2 (b) 3 (c)4 (d) 5

Q28. The general solution of $y''-9y=0$ is:

(a) $y = Ae^{-3x} + Be^{3x}$
(b) $y = Ae^{3x} + Be^{3x}$
(c) $y = Ae^{-3x} + Be^{-3x}$
(d) None of the above

Q29. Find the solution of the differential equation $(D^2 + 4)y = 0$

(a)$Acos2x + Bxsin2x$ (b) $Acos2x + Bsin2x$
(c)$e^{2x}(Acosx + Bsinx)$ (d)$e^{-x}(Acosx + Bsinx)$

Q30. The differential equation $yy'' + 2y' + y = sinx$ is...

(a)linear (b) homogeneous (c)non-linear (d)of order 3

Q31. The differential equation $(x^2 + ay)dx + (y^2 + bx)dy = 0$ is exact if

(a) $a = 2b$ (b) $a = b$ (c) $a \neq b$ (d) $a \neq 2b$

Q32. Solution of $(4x\sin 2y)dx + (4x^2\cos 2y)dy = 0$ is

(a) $x\sin 2y + y\sin 2y = c$ (b) $x^2\sin 2y = c$ (c) $2x^2\sin 2y = c$ (d) $2x\sin 2y = c$

Q33. The differential equation $M(x,y)dx+N(x,y)dy=0$ is called exact diff. equation if

(a) $\frac{\partial M}{\partial x}+\frac{\partial N}{\partial y}=0$ (b) $\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}=0$ (c) $\frac{\partial M}{\partial x}-\frac{\partial N}{\partial y}=0$ (d) $\frac{\partial N}{\partial x}+\frac{\partial M}{\partial y}=0$

Q34. Which of the following equations is an exact differential equation?

(a) $(x^2+2y)dx-xydy=0$ (b) $xdy+(2x+3y)dx=0$

(c) $x^2ydy-ydx=0$ (d) $2xy^2dx+(1+2x^2y)dy=0$

Q35. The possible integrating factor of $ydx-xdy+\log ydy=0$ is

(a) $\frac{1}{xy}$ (b) $\frac{1}{x^2+y^2}$ (c) $\frac{1}{x^2}$ (d) $\frac{1}{y^2}$

Q36. If the non- exact differential equation $M(x,y)dx+N(x,y)dy=0$ is of the form $f_1(xy)ydx+f_2(xy)xdy=0$, then the I.F is

(a) $\frac{1}{Mx-Ny}$, $Mx-Ny\neq 0$ (b) $Mx-Ny$

(c) $Mx+Ny$ (d) $\frac{1}{Mx+Ny}$, $Mx+Ny\neq 0$

Q37. The possible integrating factor of $(x^2+y^2+2x)dx+2ydy=0$ is

(a) $\frac{1}{x^2+y^2}$ (b) x (c) y (d) e^x

Q38. The solution of differential equation $xdy-ydx-2y^3dy=0$ is

(a) $x+y^3=c$ (b) $x+y^3-cy=0$ (c) $x+y^3+cy=0$ (d) none of these

Q39. The solution of differential equation $p^2-6p+9=0$ is

(a) $(x+y+c)(3x-y+c)=0$ (b) $(3x-y+c)(x-y+c)=0$

(c) $(x+y+c)(3x+y+c)=0$ (d) $(x-2y+c)(x-3y+c)=0$

Q40. The general solution of differential equation $(y-xp)(p-1)=p$ where $p=\frac{dy}{dx}$ is given by

(a) $y=cx+\frac{c}{c-1}$ (b) $y=cx-\frac{c}{c-1}$ (c) $y=c+\frac{cx}{c-1}$ (d) none of these

-- End of Question Paper --