15.10.

TB245177E

Reg. No :.....

Name :.....

BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, NOVEMBER 2024

2018, 2019, 2020, 2021 ADMISSIONS SUPPLEMENTARY

SEMESTER V - CORE COURSE (MATHEMATICS & COMPUTER APPLICATIONS)

MT5B07B18 - Differential Equations

Time : 3 Hours **Maximum Marks : 80**

Part A

I. Answer any Ten questions. Each question carries 2 marks **(10x2=20)**

1. **Determine the integrating factor of the form $x^p y^q$ of $(4xy^2+6y)\,dx+(5x^2y+8x)\,dy=0$.**
2. **Recall on what factor does the number of arbitrary constants in the general solution of a differential equation depend.**
3. **Determine the general function A such that $(x^2+3xy)dx+(Ax^2+4y)dy=0$ is exact.**
4. Evaluate the general solution $4\frac{d^2y}{dx^2}+4\frac{dy}{dx}+y=0.$
5. Write the linear combination of functions with undetermined coefficients to form the particular integral of the given differential equation $\frac{d^2y}{dx^2}+9y=e^{3x}+sin3x$ without actually solving it.
6. Compute the general solution of $\frac{d^5y}{dx^5}-2\frac{d^4y}{dx^4}+\frac{d^2y}{dx^2}=0.$
7. Evaluate the wronskian and check whether e^x and e^{2x} are linearly independent.
8. Define regular singular points.
9. Define gamma function
10. Define ordinary points.
11. Write the partial differential equation of $z=xy+f(x^2+y^2).$
12. Form the partial differential equation $2z=\frac{x^2}{a^2}+\frac{y^2}{b^2}.$

Part B

II. Answer any Six questions. Each question carries 5 marks **(6x5=30)**

13. Solve $xsinydx+(x^2+1)cosydy=0.$
14. Solve $(2x^2y+y)\,dx+(2y^3-x)\,dy=0.$
15. Solve $x^2\frac{d^2y}{dx^2}-3x\frac{dy}{dx}+3y=0$
16. Find the general solution of $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+4y=0.$
17. Solve $\frac{dx}{dt}+\frac{dy}{dt}+2y=sint$,
$\frac{dx}{dt}+\frac{dy}{dt}-x-y=0.$

18. Compute the power series solution of $\frac{d^2y}{dx^2} + x\frac{dy}{dx} - 2y = 0, y(0) = 0, y'(0) = 1.$

19. Solve the indicial equation of $2x\frac{d^2y}{dx^2} + \frac{dy}{dx} + 2y = 0.$

20. Solve the partial differential equation $\frac{y^2z}{x}p + xzq = y^2.$

21. Solve $y^2p - xyq = xz - 2xy$

Part C

III. Answer any Two questions. Each question carries 15 marks **(2x15=30)**

22. **a) Solve** $\frac{dy}{dx} + \left(\frac{2x+1}{x}\right)y = e^{-2x}.$

b) Solve $y^2dx + (3xy - 1)\,dy = 0.$

23. **Solve the differential equation** $\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} + 3\frac{dy}{dx} - 5y = 5sin2x + 10x^2 + 3x + 7$ **using the method of undetermined coefficients.**

24. Use the method of Frobenius to solve $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} - (x^2 + \frac{5}{4})y = 0.$

25. **a) Solve** $\frac{dx}{x^2(y^3 - z^3)} = \frac{dy}{y^2(z^3 - x^3)} = \frac{dz}{z^2(x^3 - y^3)}.$

b) Solve the partial differential equation $(y-z)\frac{\partial u}{\partial x} + (z-x)\frac{\partial u}{\partial y} + (x-y)\frac{\partial u}{\partial z} = 0$ **, where u is a function in x,y,z.**