

15.10.1

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 $\frac{d^2y}{dx^2} + 9y = e^{3x} + \sin 3x$ 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 $\frac{dx}{dt} + \frac{dy}{dt} + 2y = \sin t$,
 $\frac{dx}{dt} + \frac{dy}{dt} - x - y = 0$.



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

a) Solve

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

23. Solve the differential equation $\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} + 3\frac{dy}{dx} - 5y = 5\sin 2x + 10x^2 + 3x + 7$

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

a) Solve

$(y-z)\frac{\partial u}{\partial x} + (z-x)\frac{\partial u}{\partial y} + (x-y)\frac{\partial u}{\partial z} = 0$

b) Solve the partial differential equation

, where u is a function in x,y,z.

