



III Semester B.Sc. Degree Examination, April / May - 2021
MATHEMATICS - VI
3.2 : Differential Equations - I
(New)

Time : 3 Hours

Maximum Marks : 60

Instruction : Answer all the Sections.

SECTION - A

Answer any ten of the following.

10x2=20

1. Find the order and the degree of the equation.

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

2. Solve : $\frac{dy}{dx} = \sqrt{\frac{(1-y^2)}{(1-x^2)}}$
3. Show that the equation $(e^y + 1)\cos x \, dx + (e^y \cdot \sin x) \, dy = 0$ is exact and hence solve.
4. Solve : $(D^3 + 1)y = 0$

5. Evaluate : $\frac{1}{(D^2 + 4)} \cos 2x$

6. Find the general solution of the equation $(a^2 - x^2)p^2 + 2xyp + b^2 - y^2 = 0$.
7. Find the orthogonal trajectories of the family of parabola $y^2 = 4ax$.
8. Define Linear differential equation of first order and write it in the standard form.
9. Solve : $p^2 - 13p + 42 = 0$.
10. Find the part of complementary function of $x^2y'' - (x^2 + 2x)y' + (x + 2)y = 0$.
11. Show that the equation $(ax - bx^2)y'' + 2ay' + 2by = x$ is exact.

12. Solve : $4x^2 \frac{d^2y}{dx^2} + 4x \frac{dy}{dx} - y = 0$

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SECTION - B

Answer any three of the following.

3x5=15

- *13. Determine suitable integrating factor and solve : $(x^2 + y^2 + x)dx + xy dy = 0$.

14. Solve : $\frac{dy}{dx} = \frac{x+y-2}{y-x-4}$

15. Solve the equation for x

$$y = 2px + y^2 p^3.$$

16. Find the general solution of the equation $(px - y)(py + x) = a^2 p$ by using transformation $x^2 = u$ and $y^2 = v$.

17. Find the orthogonal trajectories of the family of curves $\frac{x^2}{a^2} + \frac{y^2}{b^2 + \lambda} = 1$, where λ is the parameter.

SECTION - C

Answer any three of the following.

3x5=15

18. Solve : $(D+2)(D-1)^2 y = e^{-2x} + 2 \sinhx$

19. Solve : $(2x-1)^3 \frac{d^3y}{dx^3} + (2x-1) \frac{dy}{dx} - 2y = 0$

20. Solve the simultaneous equations $\frac{dx}{dt} + x = y + e^t$, $\frac{dy}{dt} + y = x + e^t$.

21. Verify the condition of integrability and solve $yz \log z dx - zx \log z dy + xy dz = 0$.

22. Solve : $\frac{dx}{x(y^2+z)} = \frac{dy}{-y(x^2+z)} = \frac{dz}{z(x^2-y^2)}$



SECTION - D

Answer any two of the following.

2x5=10

23. Solve $\frac{d^2y}{dx^2} - (\cot x) \frac{dy}{dx} - (1 - \cot x)y = e^x \sin x$ by finding the complementary function.

24. Solve $\frac{d^2y}{dx^2} - 2 \tan x \frac{dy}{dx} + 5y = (\sec x)e^x$ by reducing it to normal form.

25. Solve $(1+x^2)^2 \frac{d^2y}{dx^2} + 2x(1+x^2) \frac{dy}{dx} + y = 0$ by changing the independent variable.

26. Show that the equation $x^2(1+x) \frac{d^2y}{dx^2} + 2x(2+3x) \frac{dy}{dx} + 2(1+3x)y = 0$ is exact and solve it.

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