



**Third Semester B.Sc. Degree Examination,
November/December 2019**

MATHEMATICS

Paper 3.2 – Differential Equations – I

(New)

Time : 3 Hours

Max. Marks : 60

Instructions : Answer *all* Sections.

SECTION – A

Answer **any ten** of the following :

(10 × 2 = 20)

1. Verify that $y = a \cos x + b \sin x$ is the solution of the equation $\frac{d^2 y}{dx^2} + y = 0$.
2. Form the differential equation of family of curves $y = e^{mx}$ where 'm' is arbitrary constant.
3. Solve: $(x^2 + 1) \frac{dy}{dx} = 1$
4. Show that the equation $(x^2 - ay) dx + (y^2 - ax) dy = 0$ is exact and hence solve it.
5. Solve: $(2D^2 + D + 2)y = 0$.
6. Evaluate: $\frac{1}{D^2 + 4} \sin 2x$.
7. Solve: $(D^2 + 3D - 4)y = 12e^{2x}$.
8. Find the orthogonal trajectories of the family of Astroids $x^{2/3} + y^{2/3} = a^{2/3}$.
9. Solve: $p^2 - 5p - 6 = 0$
10. Find the General solution of the equation $(x - 1)^2 p^2 - 2xyp + y^2 - 1 = 0$.

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11. Show that the equation $(ax - bx^2)y'' + 2ay' + 2by = x$ is exact.

12. Solve: $\frac{dx}{y^2} = \frac{dy}{x^2} = \frac{dz}{x^2y^2z^2}$.

SECTION - B

Answer **any three** of the following :

(3 × 5 = 15)

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

14. Determine the suitable integrating factor and solve the equation $xy dx - (x^2 + 2y^2) dy = 0$.

15. Solve the equation for y : $y = x + 2 \tan^{-1} p$.

16. Find the general and singular solution of $(p-1)e^{3x} + p^3e^{2y} = 0$ by using the substitution $u = e^x$ and $v = e^y$. <https://www.vskub.com>

17. Find the orthogonal trajectories of the family of curves $r^n = a^n \cos n\theta$.

SECTION - C

Answer **any three** of the following :

(3 × 5 = 15)

18. Solve: $(D^2 - 6D + 9)y = e^{3x}(x^2 + 7x + 5)$.

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

20. Solve the Simultaneous equations $D^2x - 3x - y = e^t$ and $Dy - 2x = 0$.

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

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



SECTION - D

Solve **any two** of the following :

(2 × 5 = 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: $x \frac{d^2y}{dx^2} - \frac{dy}{dx} + 4x^3y = x^5$ by changing the independent variable.
25. Solve: $x^2 \frac{d^2y}{dx^2} - 2x(1+x) \frac{dy}{dx} + 2(1+x)y = x^3$ ($x > 0$) by changing dependent variable.
26. Show that the equation $(2x^2 + 3x)y'' + (6x + 3)y' + 2y = (x + 1)e^x$ is exact and solve it.
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