2E3201

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B.Tech. II-Sem. (Main/Back) Examination, May/June - 2025

2FY2-01 Engineering Mathematics - II

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given upto 25 Words Only)

All questions are compulsory. **(10×2=20)**

1. Find the solution of the differential equation:

$$(D - 3)^3 y = 0; \text{ where } D = \frac{d}{dx}.$$

2. The nullity of matrix $A = \begin{bmatrix} 1 & 2 & 4 \\ 2 & 4 & 8 \\ 4 & 8 & 16 \end{bmatrix}$ is?

3. Write an example of Bernoulli's differential equation.

4. Write the degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^2 - \left[4x + \left(\frac{dy}{dx}\right)^2\right]^4 = 0$.

5. Check whether the differential equation $(x^2 - 2y)dx - (2x - y^2)dy = 0$ is exact or not.

6. Classify the following partial differential equation:

$$x\frac{\partial^2 z}{\partial x^2} + 5\frac{\partial^2 z}{\partial x \partial y} + y\frac{\partial^2 z}{\partial y^2} + 5\frac{\partial z}{\partial y} = 0.$$

7. Find the solution of DE $y = px + \text{cosec}\,(1 + 2p)$.

8. Find the solution of the differential equation:

$$\frac{dx}{y} = \frac{dy}{x} = \frac{dz}{z}.$$

9. State Caley-Hamilton Theorem.
10. Write Charpit's Auxiliary equation for the solution of first order partial differential equations.

PART - B

(Analytical/Problem Solving Questions)

Attempt any Five questions. **(5×4=20)**

1. Demonstrate the rank of matrix $A = \begin{bmatrix} 1 & 2 & 8 & 5 \\ 0 & 4 & 6 & 3 \\ 0 & 0 & -1 & 0 \\ 1 & 2 & 2 & 2 \end{bmatrix}$.
2. Identify the consistency of the system of linear equation $x + y + z = 0$, $2x + y + z = 0$, $3x + 2y = 4$.
3. Find the solution of differential equation $(x^2D^2y - xDy - 2y) = 0$.
4. Solve the following differential equation $(x^2y^2 + xy + 1)\,ydx + (x^2y^2 - xy + 1)xdy = 0$.
5. Find the solution of the following PDE: $(xy - zx)p + (yz - xy)q - (xz - yz) = 0$.
6. Using the method of separation of variables, solve

$$\frac{\partial z}{\partial x} = 2\frac{\partial z}{\partial y}, \text{ where } z(x, 0) = 6e^{-3x}.$$

7. Find the C.F. of DE $\frac{d^4y}{dx^4} - 81y = \cosh 3x$.

PART - C

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any Three questions. **(3×10=30)**

1. Diagonalize the matrix $A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$.
2. Find the solution of differential equation $xp^2 - 2yp + x = 0$.
3. Find the complete integral of given P.D.E. $px + qy = pq$ by Charpit's method.
4. Find the Solution of differential equation $(D^2 - 3D + 2)y = \sin 3x + x^2 + x + e^{4x}$.
5. Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ which satisfies the conditions

$u(0, y) = u(l, y) = u(x, 0) = 0$ and $u(x, a) = \sin\frac{n\pi x}{l}$.