2E2401

Roll No. ____________________ [Total No. of Pages : 3

2E2401

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

BSC

2FY2-01 Engineering Mathematics - II

Time : 3 Hours **Maximum Marks : 160**

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Four questions out of Five 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 up to 25 words only)

All questions are compulsory. **(10×3=30)**

1. Find the rank of matrix A:

$$A=\begin{bmatrix}1 & 2 & 3\\ 2 & 3 & 1\\ 3 & 1 & 2\end{bmatrix}$$

2. State the rank-nullity theorem.

3. For a given linear differential equation of first order $\cos^2 x\frac{dy}{dx}+y=\tan x$; Find the integrating factor (I.F).

4. Solve: $P^2-9P+18=0$

5. Find the complementary function (C.F.) of differential equation.

$\left(D^2+3D+2\right)y=e^x;\ D\equiv d/dx$

6. Write the Legendre differential equation.

7. Solve the partial differential equation (Lagrange form) $yzp+zxq=xy$

8. Find the complete integral of partial differential equation: $z=px+qy+pq$.

9. Classify the following partial differential equation $\frac{\partial^2 z}{\partial x^2}+\frac{\partial^2 z}{\partial y^2}=0$.

10. Write the one dimensional heat equation.

PART - B

(Analytical/Problem Solving questions)

Attempt any Five questions. **(5×10=50)**

1. Reduce the given matrix into normal form and hence find the rank.

$$A=\begin{bmatrix}0 & 1 & -3 & -1\\ 1 & 0 & 1 & 1\\ 3 & 1 & 0 & 2\\ 1 & 1 & -2 & 0\end{bmatrix}$$

2. Examine the consistency for following equations and solve them if they are consistent.

$$x+y+z=6$$
$$2x+y+3z=13$$
$$5x+2y+z=12$$
$$2x-3y-2z=-10$$

3. Solve the following exact differential equation of first order:

$$(x^2y^2+xy+1)y\,dx+(x^2y^2-xy+1)x\,dy=0$$

4. Solve: $(D^2+1)y=e^{-x}+\cos x+x^3$

5. Find the power series solution of $(2-x^2)\frac{d^2y}{dx^2}+2x\frac{dy}{dx}-2y=0$

6. Find the complete integral of the partial differential equation:

$$9(P^2z+q^2)=4$$

7. Apply separation of variables method to solve two dimensional laplace equation and write general solution.

PART -C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any Four questions. **(4×20=80)**

1. Verify cayley Hamilton theorem for matrix. $A=\begin{bmatrix}0 & 1 & 2\\ 1 & 2 & 3\\ 3 & 1 & 1\end{bmatrix}$ and hence find A^{-1}

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

3. Solve by the method of variation of parameters. $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}-y=x^2e^x$.

4. Find the complete integral by charpit's method for partial differential equation

$2xz-px^2-2qxy+pq=0$.

5. Solve the following by the method of separation of Variables: $\frac{\partial^2u}{\partial x^2}+\frac{\partial^2u}{ry^2}=0$; Satisfying the conditions: $u(0,y)=u(l,y)=u(x,0)=0$ and $u(x,a)=\sin\frac{\pi x}{l}$.
