2E3201

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2E3201

B. Tech. II - Sem. (Main / Back) Exam., - 2023

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 may 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)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Determine the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 1 & 6 & 5 \end{bmatrix}$

Q.2 State the Cayley-Hamilton Theorem.

Q.3 Write the Integrating Factor (I.F.) of the following differential equation - $(x + 2y^3)\, dy = ydx$.

Q.4 Write the condition of exactness of the differential equation $Mdx + Ndy = 0$.

Q.5 Solve – $(D^3 - 3D^2 + 4)\, y = 0$, $D \equiv d/dx$

Q.6 Write the Legendre differential equation.

Q.7 Find the partial differential equation from $Z = ax + by + ab$.

Q.8 Write the Lagrange form.

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

Q.10 Write the one dimensional heat equation.

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Reduce the matrix in its normal form and hence find its rank -

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

Q.2 For what values of k, the equations $x + y + z = 1$, $2x + y + 4z = k$, $4x + y + 10z = k^2$ have a solution, and solve in each case.

Q.3 Solve – $y = 2px - p^2$

Q.4 Solve – $(D^2 + 2D + 1)\, y = e^x + x^2 - \sin x$

Q.5 Solve the differential equation by method of change of dependent variable – $\frac{d^2y}{dx^2} - 2\tan x \frac{dy}{dx} + 5y = e^x \sec x$

Q.6 Solve the following –

$x^2 (y-z)\, p + y^2 (z-x)\, q = z^2 (x - y)$

Q.7 Describe the method of separation of variables.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Verify Cayley Hamilton theorem for the matrix $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$

Hence, find A^{-1}

Q.2 Solve the following differential equation –

$(x^4y^4 + x^2y^2 + xy)\, y\, dx + (x^4y^4 - x^2y^2 + xy)\, x\, dy = 0$

Q.3 Solve by the method of variation of parameter –

$x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = x^2e^x$

Q.4 Solve by Charpit's method –

$px + qy = pq$

Q.5 Solve the Laplace equation – $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ by the method of separation of variable.
