2E3201

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2E3201

B. Tech. II - Sem. (Main / Back) Exam., - 2024

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 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 State the rank-nullity theorem.

Q.2 Define orthogonal matrix.

Q.3 Write the Integrating Factor (I.F.) of the following differential equation -

$$(1+y^2)\,dx = (\tan^{-1} y - x)\,dy$$

Q.4 Write the Clairaut's form of ordinary differential equation.

Q.5 Solve : $(D^2 - 3D + 2)\,y = e^x$

Q.6 Define power series.

Q.7 Form the partial differential equation, given that $z = a(x + y) + b$.

Q.8 Solve : $a(p + q) = z$

Q.9 Classify the following equation –

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

Q.10 Write the one dimensional wave equation.

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Reduce the matrix –

$$A = \begin{bmatrix} 1 & 2 & 1 & 0 \\ -2 & 4 & 3 & 0 \\ 1 & 0 & 2 & -8 \end{bmatrix}$$

to normal form, and hence find the rank.

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

Q.3 Solve : $(D^2 + 3D + 2)\, y = e^{2x} \sin x$

Q.4 Solve : $\sin^2 x \frac{d^2y}{dx^2} - 2y = 0$

Q.5 Solve : $\frac{dx}{z-y} = \frac{dy}{x-z} = \frac{dz}{y-x}$

Q.6 Solve : $9(p^2z + q^2) = 4$

Q.7 Using the method of separation of variables, solve -

$$\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$$

Where $u(x, 0) = 6e^{-3x}$

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Verify Cayley Hamilton theorem for matrix -

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

and hence find its inverse.

Q.2 Solve -

$$(x^4y^4 + x^2y^2 + xy)\, ydx + (x^4 y^4 - x^2 y^2 + xy)\, xdy = 0$$

Q.3 Apply the method of variation of parameter to solve -

$$\frac{d^2y}{dx^2} - y = \frac{2}{1 + e^x}$$

Q.4 Apply Charpit's method to solve -

$$px + qy = pq$$

Q.5 Discuss the solution of two dimensional Laplace's equation.
