2E2401

Roll No. _____ Total No. of Pages: 3

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B. Tech. II - Sem. (Main / Back) Exam., March – 2021

BSC

2FY2-01 Engineering Mathematics - II

Time: 2 Hours **[To be converted as per scheme]**

Max. Marks: 110

Min. Marks: 39

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of seven questions from Part B and two 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

(Answer should be given up to 25 words only) **[10×3=30]**

All questions are compulsory

Q.1 Define symmetric and skew – symmetric matrices.

Q.2 Define echelon form of a matrix.

Q.3 What is integrating factor?

Q.4 Define Bernoulli's equation.

Q.5 Give the definitions of complemcntary function and particular integral.

Q.6 Find the c.f. of $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 2y = x + \cos x$.

Q.7 Define –

(a) Ordinary point

(b) Singular point and

(c) Regular singular point of linear differential equation

Q.8 Find the partial differential equation by –

$az + b = a^2x + y.$

Q.9 Solve –

$r = a^2t.$

Q.10 Classify the following P.D.E. –

$$\frac{\partial^2 z}{\partial x^2} = \frac{1}{c}\frac{\partial z}{\partial y}$$

PART – B

(Analytical/Problem solving questions) **[4×10=40]**

Attempt any four questions

Q.1 Find the Eigen values and Eigen vectors of –

$$A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}.$$

Q.2 Reduce the matrix $B = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \\ 3 & 0 & 5 & -10 \end{bmatrix}$ to its canonical form and find rank.

Q.3 Solve - $(3x^2y + y/x)\,dx + (x^3 + \log x)\,dy = 0$

Q.4 Solve - $p^3(x + 2y) + 3p^2(x + y) + (y + 2x)p = 0$

Q.5 Solve - $(2x^2 + 3x)\frac{d^2y}{dx^2} + (6x + 3)\frac{dy}{dx} + 2y = (x + 1)e^x$

Q.6 Solve - $p^2 + q^2 = x + y;\ p = \frac{\partial z}{\partial x}, q = \frac{\partial z}{\partial y}$

Q.7 Solve - $xr + p = 9x^2y^3;\ r = \frac{\partial^2 z}{\partial x^2}, p = \frac{\partial z}{\partial x}$

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[2×20=40]**

Attempt any two questions

Q.1 State Cayley–Hamilton Theorem. Verify it for the matrix $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$ and find A^{-1}.

Q.2 Solve the series –

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

Q.3 Solve -

(a) $(1 + y^2) + \left(x - e^{-\tan^{-1} y}\right)\frac{dy}{dx} = 0.$

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

Q.4 Solve -

$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, Satisfying the condition $u(0, y) = u(\ell, y) = u(x, 0) = 0$ and

$u(x, a) = \sin\frac{\pi x}{\ell}$

Q.5 Solve - $(x^2 - y^2)pq - xy(p^2 - q^2) - 1 = 0$ by Charpit's Method.