

Roll No.

Total No. of Pages : 03

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**B.Tech. (CE/CSE/EE/ME/ECE) (Sem-2)**  
**ENGINEERING MATHEMATICS – II**

Subject Code : BTAM-102

M.Code : 54092

Date of Examination : 16-06-2023

Time : 3 Hrs.

Max. Marks : 60

**INSTRUCTIONS TO CANDIDATES :**

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

**SECTION-A**

1. Answer briefly :

- a) Check whether the given equation  $(1+x^2)dy + 2xydx = 0$  is exact and obtain the general.
- b) Find the general value of  $\text{Log}(-N)$
- c) If  $A = \begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}$ . Hence find  $A^{-1}$ .
- d) State Cayley Hamilton theorem.
- e) Solve  $\frac{dy}{dx} + y \cot x = \cos x$
- f) Solve  $(2x - y)dx = (x - y)dy$
- g) Find the general solution of  $4\frac{d^2y}{dx^2} + \frac{dy}{dx} + 2y = 0$
- h) Give an example of a matrix which is Skew Symmetric but not Skew Hermitian.

i) Examine the vectors for Linear dependence

$$X_1 = (3, 1, -4), X_2 = (2, 2, -3), X_3 = (0, -4, 1)$$

j) Slate Logarithmic test.

### SECTION-B

2. a) Solve  $x^2 y'' + 5xy' + 3 = \ln x$

b) Solve the differential equations  $(y^2 + 2x^2 y) dx + (2x^3 - xy) dy = 0$ .

3. a) Apply method of variation of parameters to solve  $\frac{d^2 y}{dx^2} + 9y = \sec 3x$ .

b) Solve  $\left(1 + e^y\right) dx + e^y \left(1 - \frac{x}{y}\right) dy = 0$

4. An alternating e.m.f  $E \sin wt$  is applied to inductance  $L$  and capacitance  $C$  in series.

Show that the current in the circuit is  $\frac{Ew}{(n^2 - w^2)L} (\cos wt - \cos nt)$ , where  $n^2 = \frac{1}{LC}$

5. a) Solve the differential equation  $\frac{d^2 y}{dx^2} - 6\frac{dy}{dx} + 13y = e^{3x} \sin 4x$ .

b) Solve the Clairaut equation  $y^2 - xy' + y = 0$ .

### SECTION-C

6. a) Separate into real and imaginary parts  $\log(\sin(x + iy))$

b) Find all the values of  $z$  which satisfy  $e^z = 1 + i$

7. a) Expand  $\cos^6 \theta$

b) Find the rank of the matrix 
$$\begin{bmatrix} 6 & 1 & 3 & 8 \\ 4 & 2 & 6 & -1 \\ 10 & 3 & 9 & 7 \\ 16 & 4 & 12 & 15 \end{bmatrix}$$

8. a) Test the convergence of  $x + \frac{2^2 x^2}{2!} + \frac{3^3 x^3}{3!} + \frac{4^4 x^4}{4!} + \dots - \infty$

b) Test the convergence of  $\sum \frac{1}{\left(1 + \frac{1}{n}\right)^{n^2}}$

9. a) Use Gauss Jordan method to find the inverse of a matrix  $\begin{bmatrix} 2 & 4 & 3 & 2 \\ 3 & 6 & 5 & 2 \\ 2 & 5 & 2 & -3 \\ 4 & 5 & 14 & 14 \end{bmatrix}$

b) Show that the Matrix  $A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$  is similar to the diagonal Matrix. Also find the transforming Matrix and the diagonal Matrix.

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**