

**Roll No.**

**Total No. of Pages : 03**

**Total No. of Questions : 09**

**B.Tech. (Aeronautical Engg./Aerospace Engg./ Automation & Robotics/Automobile Engg./BT/CE/CSE/Electrical & Electronics Engg./EE/ECE/Electronics & Electrical Engg./IT/ICE/Marine Engg./Mechanical Engg. Petroleum Refinery Engg./Textile Engg.) (2012 to 2017) (Sem.-2)**

## ENGINEERING MATHEMATICS – II

**Subject Code : BTAM-102**

**M.Code : 54092**

**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. Solve the following :**

- a) Solve the differential equation  $\frac{dy}{dx} + y \cot x = \cos x$ .
- b) Define Clairaut's equation and find its general solution.
- c) Solve  $(1+x)^2 \frac{d^2y}{dx^2} + (1+x) \frac{dy}{dx} + y = 0$ .
- d) Solve  $\frac{d^4y}{dx^4} + 8 \frac{d^2y}{dx^2} + 16y = 0$ .
- e) Define damping forces and write down the differential equation representing damped oscillations.
- f) Find the rank of the matrix  $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 1 \\ 2 & 2 & 1 \end{bmatrix}$
- g) Define an orthogonal matrix.

- h) Discuss the absolute and conditional convergence of  $\sum_{n=2}^{\infty} \frac{(-1)^n}{n+1}$ .
- i) Separate  $\sin(x + iy)$  into real and imaginary parts.
- j) Find general solution of  $4y'' + 8y' - 5y = 0$ .

### SECTION-B

2. a) Solve the differential equation by making it Exact differential equation :

$$(x^2 + y^2 + 2x) dx + 2y dy = 0$$

- b) Solve the differential equation  $xp^2 - 2yp + x = 0$ , where  $p = \frac{dy}{dx}$ .

3. a) Find the general solution of the differential equation  $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = xe^x \cos x$ .

- b) Apply Method of Variation of parameters to solve  $\frac{d^2y}{dx^2} + 4y = \tan 2x$ .

4. An e.m.f.  $E \sin \omega t$  is applied to a circuit consisting of an inductance  $L$ , resistance  $R$  and capacitance  $C$  in series. Obtain the differential equation involving current and time as dependent and independent variables respectively. Find the current if :

a)  $CR^2 < 4L$

b)  $CR^2 > 4L$ .

5. Solve the following simultaneous differential equations ;

$$\frac{dx}{dt} + 4x + 3y = t$$

$$\frac{dy}{dt} + 2x + 5y = e^t$$

### SECTION-C

6. a) Test for consistency and solve :

$$5x + 3y + 7z = 4, 3x + 26y + 2z = 9, 7x + 2y + 10z = 5$$

- b) Examine for Linear dependence of the vectors :

$$[1, 2, 4], [2, -1, 3], [0, 1, 2], [-3, 7, 2].$$

7. Diagonalize the matrix and obtain its modal matrix  $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ .

8. a) Test the convergence of the series  $\sum_{n=2}^{\infty} \frac{\sqrt{n^2-1}}{n^3+1}$ .

- b) Discuss the convergence of  $\frac{1^2}{2^2} + \frac{1^2 3^2}{2^2 4^2} + \frac{1^2 3^2 5^2}{2^2 4^2 6^2} + \dots$  to  $\infty$ .

9. a) Find all the values of  $(1+i\sqrt{3})^{\frac{3}{4}}$  and show that their continued product is 8.

- b) Find the sum of the series  $1 - \frac{1}{2}\cos\theta + \frac{1.3}{2.4}\cos 2\theta + \frac{1.3.5}{2.4.6}\cos 3\theta + \dots$  to  $\infty$ .

**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.**