Roll No. | | | | | | | | | | | | **Total No. of Pages: 02**

Total No. of Questions: 09

B.Tech (Sem. – 2)
ENGINEERING MATHEMATICS-II
Subject Code: BTAM-102
M Code: 54092
Date of Examination : 17-01-23

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, carrying EIGHT marks each.**
3. **Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.**

SECTION-A

1. Answer the following:

a) Define Exact differential equation and write necessary condition for the differential equation $Mdx + Ndy = 0$ to be exact.

b) Find the Integrating factor of $ydx - xdy + 3x^2y^2e^{x^3}dx = 0$

c) Solve the differential equation $\frac{d^4y}{dx^4} + 8\frac{d^2y}{dx^2} + 16y = 0$

d) Define Legendre's linear differential equation.

e) Find the rank of the matrix $\begin{bmatrix} 1 & 3 & 4 & 5 \\ 1 & 2 & 6 & 7 \\ 1 & 5 & 0 & 10 \end{bmatrix}$.

f) If A and B are hermitian, show that $AB - BA$ is a skew hermitian.

g) Test the convergence of $\frac{1}{5} + \frac{\sqrt{2}}{7} + \frac{\sqrt{3}}{9} + \frac{\sqrt{4}}{11} + \ldots\ldots\infty$.

h) Define absolute convergence of a series.

i) Find the cube roots of unity.

j) Separate in real and Imaginary part of $\tan(x + iy)$.

SECTION-B

2. Sum the series $\cos\theta - \frac{1}{2}\cos 2\theta + \frac{1}{3}\cos 3\theta - \ldots\ldots\ldots\ldots\infty$

3. For what value of K, the equations $x + y + z = 1, 2x + y + 4z = k, 4x + y + 10z = k^2$ have a solution and solve them completely in each case.

4. Discuss the convergence of the series:

$$1 + \frac{\alpha.\beta}{1.v}x + \frac{\alpha(\alpha+1)\beta(\beta+1)}{1.2.v.(v+1)}x^2 + \frac{\alpha(\alpha+1)(\alpha+2)\beta(\beta+1)(\beta+2)}{1.2.3.v(v+1)(v+2)}x^3 + \ldots..$$

5. a) Express log (Logi) in the form $A + iB$. (4)

   b) Discuss the convergence of series $\sum_{n=2}^{\infty} \frac{1}{n(\log n)^p}\,(p > 0)$ (4)

SECTION-C

6. Solve $((2x^2y^2 + y)dx + (3x - x^3y)dy = 0$

7. a) Solve :$xy(1 + xy^2)\frac{dy}{dx} = 1$ (4)

   b) Find the general solution of the equation $y'' + 16y = 32\sec 2x$ using method of variation of parameters. (4)

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

9. A constant electromotive force E volts is applied to a circuit containing a constant resistance R ohms in series and a constant inductance L henries. If the initial current is zero, show that the current builds up to half its theoretical maximum in (Llog2)/R seconds.

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