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

Total No. of Questions : 09

B.Tech. (2011 Onwards) (Sem.–2)

ENGINEERING MATHEMATICS – II

Subject Code : BTAM-102

Paper ID : [A1111]

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. **Write briefly :**

a) Check the $(3x^2 + 2e^y)\,dx + (2xe^y + 3y^2)dy = 0$ equation for exactness.

b) Find the solution of the differential equation $y'' + 2y' + 2y = 0$.

c) It is known that $\frac{1}{x}$ is a solution of the differential equation $x^2y'' + 4xy' + 2y = 0$. Find the second linearly independent solution.

d) Write the differential equation governing the flow of current in an LCR circuit.

e) Find the general value of i^i.

f) Define orthogonal matrix.

g) Show that the vectors are linearly independent (1, –1, 0) (0, 1, –1) (0, 0, 1).

h) State comparison test for convergence of infinite series.

i) Write Clairaut's equation.

j) State Cauchy's convergence criterion for infinite series.

SECTION-B

2. a) Find the solution of the differential equation $(5x^3 + 12x^2 + 6y^2)\, dx + 6xydy = 0$.

   b) Solve the differential equation $y' + 4xy + xy^3 = 0$.

3. a) Find the general solution of the differential equation $y'' - 5y' + 4y = 65 \sin 2x$ using operator method.

   b) Find the general solution of the equation $x^2 y'' - 5xy' + 13y = 30x^2$.

4. An LCR circuit with battery e.m.f $E \sin pt$ is turned to resonance so that $p^2 = \dfrac{1}{LC}$.

   Show that for small value of $\dfrac{R}{L}$ the current in the circuit at time t is given by $\dfrac{E}{2L} \sin pt$

5. a) Solve the initial value problem $e^x (\cos y dx - \sin y dy) = 0$ $y(0) = 0$.

   b) Find the general solution of the differential equation $y'' - 4y' + 4y = e^{-2x}$ by the method of variation of parameters.

SECTION-C

6. a) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 & 0 \\ -1 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}$ and hence obtain A^{-1}.

   b) Using Gauss-Jordan method, find the inverse of the matrix $A = \begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$.

7. Discuss the convergence of the following series :

   a) $\sum \dfrac{z^n}{n(n+2)}$.

   b) $1 + \dfrac{x}{2} + \dfrac{2!}{3^2} x^2 + \dfrac{3!}{4^3} x^3 + \ldots\ldots..$

8. a) Solve the equation $(z-1)^3 = 8$.

   b) Find all values of z such that $\sin z = 2$.

9. a) Find $|z|$ and $Arg(z)$ when $z = \dfrac{(2-3i)\overline{(1+i)}}{(2+i)}$.

   b) For the set of vectors $\{x_1, x_2\}$, where $x_1 = (1,3)^T$, $x_2 = (4,6)^T$, are in R^2, find the matrix of linear transformation $T : R^2 \to R^3$ such that $Tx_1 = (-2, 2, -7)^T$, $Tx_2 = (-2, -4, -10)^T$.