Roll No. $\square\square\square\square\square\square\square\square\square\square\square\square$ **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech.(2008-2010 Batches) (Sem.–2)

ENGINEERING MATHEMATICS – II

Subject Code : AM-102

Paper ID : [A0119]

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) Define Rank of a matrix. What is the Rank of $n \times n$, non singular matrix?

(b) Give the condition when non-Homogeneous system of linear simultaneous equations has a unique solution. What is the condition for homogeneous system of linear simultaneous equations to have non-trivial solution?

(c) State the condition when $M\,dx + N\,dy = 0$ is an exact differential equation. Also, explain the use of integrating factor.

(d) Find Integrating factor for the equation.

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

(e) Solve $\dfrac{d^4x}{dt^4} + 4x = 0$

(f) Find Particular Integral of $\dfrac{d^2y}{dx^2} + \dfrac{dy}{dx} = x^2 + 2x + 4$.

(g) Find Curl $\vec{F}$ at the point (1, 2, 3) given

$\vec{F} = \text{grad}\,(x^3y + y^3z + z^3x - x^2y^2z^2)$.

(h) State Gauss Divergence theorem.

(i) In Poisson Distribution if $2P(x = 1) = P(x = 2)$, then find the variance.

(j) What are mean and variance of a χ^2 distribution with 8-degress of freedom?

SECTION-B

2. If $f = (x^2 + y^2 + z^2)^{-n}$, find div (grad f) and determine 'n' if div (grad f) = 0.

3. Verify Green's theorem for $\int_C [(xy + y^2)dx + x^2 dy]$, where C is bounded by $y = x$ & $y = x^2$.

4. In a a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and S.D. of the distribution.

5. A set of five similar coins is tossed 320 times and the result is

No. of Heads :	0	1	2	3	4	5
Frequency :	6	27	72	112	71	32

Test the hypothesis that the data follow a binomial distribution.

SECTION-C

6. (i) Show that the matrix $\begin{bmatrix} \alpha + i\gamma & -\beta + i\delta \\ \beta + i\delta & \alpha - i\gamma \end{bmatrix}$ is a unitary matrix, if $\alpha^2 + \beta^2 + \gamma^2 + \delta^2 = 1$.

(ii) Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$.

7. (i) Solve $(y \log y)\, dx + (x - \log y)\, dy = 0$.

(ii) $p = \sin (y - xp)$.

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

9. In an L – C – R circuit the charge q on a plate of a condenser is given by

$$L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = E \sin pt$$

The circuit is tuned to resonance so that $p^2 = 1/LC$. If initially the current i and the charge q be zero, show that for small values of R/L, the current in the circuit at time t is given by $(Et / 2L) \sin pt$.