

**B. Tech. DEGREE EXAMINATION, MAY - 2015**

**(Examination at the end of First Year**

**Paper - II : Mathematics - II**

**Time : 3 Hours**

**Maximum Marks : 75**

Answer question No. 1 compulsory

(15)

Answer one question from each unit

(4 x 15 = 60)

1) a) Write conditions system of linear equation of the form  $AX = B$ .

b) Find Rank of  $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 1 & 2 & 3 \end{pmatrix}$ .

c)  $A = \begin{pmatrix} 5 & 4 \\ 1 & 2 \end{pmatrix}$  find the quadratic form of A.

d) Find the eigen value  $A = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 0 & 0 & -4 \end{pmatrix}$

e) State Lagrange's mean value theorem.

f) Write expansion of  $e^x$  using Taylor series.

g) If  $f(x, y) = xy + (x - y)$  the stationary points are.

h) Find the radius of curvature at the origin of the curve  $y = x^4 - 4x^3 - 18x^2$

i) Evaluate  $\int_0^2 \int_0^x y \, dy \, dx$ .

j)  $\int_0^{\pi} \int_0^{a \cos \theta} r \sin \theta \, dr \, d\theta$

k) Define gamma function.

l) Define gradient.

m) Define  $\nabla \phi$

n)  $\vec{f} = x_1\vec{i} + x_2\vec{j} + x_3\vec{k}$  then  $\nabla \times \vec{f}$

o) State stoke's theorem.

### Unit - I

2) a) Investigate for what values of  $\lambda$  and  $\mu$  the system of simultaneous equations.

$$x + y + z = 6, \quad x + 2y + 3z = 10, \quad x + 2y + \lambda z = \mu \text{ has}$$

- i) no solution
- ii) a unique solution
- iii) an infinite number of solutions.

b) Find the eigen values and Eigen vector of the matrix.

$$A = \begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$$

OR

c) Verify the cayley – Hamilton theorem for the matrix A and find its inverse

$$A = \begin{pmatrix} 1 & 2 & 0 \\ 2 & -1 & 0 \\ 0 & 0 & -1 \end{pmatrix}$$

d) Find the Eigen values and Eigen vectors of matrix

$$A = \begin{pmatrix} i & 0 & 0 \\ 0 & 0 & i \\ 0 & i & 0 \end{pmatrix}$$

### Unit – II

3) a) Write taylor series for  $f(x) = (1 - x)^{5/2}$  with Lagranges form of remainder up to 3terms in the internal  $[0.1]$ .

b) Examine for minimum and maximum values of  $\sin x + \sin y + \sin(x + y)$ .

OR

c) Find the maximum and minimum of  $U = x^2 + y^2 + z^2$  if  $ax^2 + by^2 + cz^2 = 1$  and  $lx + my + nz = 0$

**Unit – III**

- 4) a) Evaluate  $\iint (x^2 + y^2) dx dy$  over the area bounded by ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ .
- b) Evaluate the triple integral  $\iiint xy^2z dx dy dz$  taken through the positive octant of the sphere  $x^2 + y^2 + z^2 = a^2$ .

OR

- c) Find the volume common to the cylinders  $x^2 + y^2 = a^2$  and  $x^2 + z^2 = a^2$ .
- 5) a) Using Green's theorem evaluate  $\oint_C (2x^2 - y^2) dx + (x^2 + y^2) dy$  where  $C$  is the boundary in  $xy$  -plane of the arc enclosed by  $x$  - axis and the semicircle  $x^2 + y^2 = 1$  in the upper half of the  $xy$  - plane.

OR

- b) Verify Gauss divergence theorem for  $f = x^3\bar{i} + y^3\bar{j} + z^3\bar{k}$  taken over the cube bounded by  $x = 0, x = a, y = 0, y = a, z = 0, z = a$ .

