(DE 102)

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 tagange'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) $\overline{f} = x_1 i + x_2 j + x_3 k$ then $\nabla \times \overline{f}$

o) State stoke's theorem.

Unit - I

2) a) Investigate for what values of λ and μ the system of simultaneous equations.

$x + y + z = 6, \quad x + 2y + 3z = 10, x + 2y + \lambda z = \mu$ 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 $\bar{f} = x^3\bar{i} + y^3\bar{j} + z^3\bar{k}$ taken over the cube bounded by $x = 0$, $x = a$, $y = 0$, $y = a$, $z = 0$, $z = a$.

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