MA111

Hall Ticket Number:

I/IV B.Tech (Supplementary) DEGREE EXAMINATION

November, 2019 — **Common to all branches**

First Semester — **Mathematics - I**

Time: Three Hours — **Maximum:** 60 Marks

Answer Question No.1 compulsorily. (1X12 = 12 Marks)

Answer ONE question from each unit. (4X12=48 Marks)

1. Answer all questions (1X12=12 Marks)
   a) Are the vectors (1,3) and (-2,5) are linear independent or dependent?
   b) When does a non homogeneous system consistent?
   c) Give an example of a 3X 3 Skew Symmetric matrix.
   d) Write Rolle's theorem.
   e) Define linear independent vectors.
   f) Define skew-Hermitian matrix.
   g) Define a saddle point.
   h) Solve $\frac{dy}{dx} = xy$
   i) State Bernoulli's equation.
   j) State Newton's law of cooling.
   k) Find the complete solution of $D^2 - 2\ y = 0$.
   l) State Euler – Cauchy equation.

UNIT I

2. a) Determine the rank of the matrix $A = \begin{bmatrix} -2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ by reducing it to row echlon form. 6M

   b) For what values 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. 6M

(OR)

3. a) Find eigen values and the corresponding eigen vectors of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ 6M

   b) Are the vectors $1\ 1\ 0, 1\ 0\ 0, 1\ 1\ 1, 1\ 2\ 3$ linearly dependent? If so express one of the vectors as a linear combination of others. 6M

UNIT II

4. a) Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to principal axes and also write matrix of transformation. 6M

   b) If $f(x) = \sin^{-1} x, 0 < a < b < 1$, use mean value theorem to prove that $\frac{b-a}{\sqrt{1-a^2}} < \sin^{-1} b - \sin^{-1} a < \frac{b-a}{\sqrt{1-b^2}}$ 6M

(OR)

5. a) Verify Lagrange's mean value theorem for $f\ x = x-1\ x-2\ x-3$ in (0, 4). 6M

   b) Show that a rectangular solid of maximum volume that can be inscribed in sphere is a cube. 6M

UNIT III

6. a) Solve $2x + xy\ dx + 2xdy = 0$ 6M

   b) Solve $y' - y = e^{2x},\ y\ 0 = 1$ 6M

(OR)

7. a) Find the orthogonal trajectories of the family of parabolas $y^2 = 4ax$. 6M

   b) Solve $1 + x^2\ y' + 3xy - 6x = 0$. 6M

UNIT IV

8. a) Find a real general solution of $x^2 y'' - 4xy' + 6y = 0$ 6M

   b) Solve by the method of undermined coefficients $D^2 + 1\ y = \sin x$ 6M

(OR)

9. a) Solve $x^2 D^2 + 9xD + 16\ y = 0$ 6M

   b) Solve $(D^2 - 3D + 2)\ y = x^2$ by the method of undetermined Coefficients. 6M