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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)

(1X12=12 Marks)

1. Answer all questions

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

UNIT I

- 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
- 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)

- 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
- 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

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

- Verify Lagrange's mean value theorem for $f(x) = (x-1)(x-2)(x-3)$ in (0, 4). 6M
- Show that a rectangular solid of maximum volume that can be inscribed in sphere is a cube. 6M

UNIT III

- Solve $(2x + xy)dx + 2xdy = 0$ 6M
- Solve $y' - y = e^{2x}$, $y(0) = 1$ 6M

(OR)

- Find the orthogonal trajectories of the family of parabolas $y^2 = 4ax$. 6M
- Solve $(1 + x^2)y' + 3xy - 6x = 0$. 6M

UNIT IV

- Find a real general solution of $x^2y'' - 4xy' + 6y = 0$ 6M
- Solve by the method of undermined coefficients $(D^2 + 1)y = \sin x$ 6M

(OR)

- Solve $(x^2D^2 + 9xD + 16)y = 0$ 6M
- Solve $(D^2 - 3D + 2)y = x^2$ by the method of undetermined Coefficients. 6M

