CODE: 17CA54101

B. Tech I Year I Semester Regular Examinations, December 2017

MATHEMATICS – I

(Common to all branches)

Time: 3 hours | Max Marks: 70

PART – A

1. Answer any **ten** questions (10 x 2 = 20 Marks)

(a) Define rank of a matrix.
(b) Define an orthogonal matrix.
(c) State any two properties of Eigen values.
(d) Find all the eigen values of $A=\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$ and the eigen vector corresponding to least eigen value.
(e) State Cauchy mean value theorem.
(f) Explain the method of Lagrangian multipliers.
(g) Write the governing equation of an LCR circuit with an e.m.f E_0.
(h) For what value of a and b the differential equation $(y+x^3)dx+(ax+by)dy=0$ is exact. Also Solve.
(i) Write the steps involved in solving a linear differential equation.
(j) Solve: $(D^2+a^2)y=0$.
(k) Explain the procedure of finding particular integral of $f(x)=e^{ax}.v(x)$.
(l) If $x^y+y^x=c$, a constant, find dy/dx using partial derivatives.

PART - B

Answer all five units (5 x 10 = 50 Marks)

UNIT-I

2. Express the matrix, $A = \begin{bmatrix} 1 & 5 & 7 \\ -1 & -2 & -4 \\ 8 & 2 & 13 \end{bmatrix}$ as sum of Symmetrix and Skew Symmetric matrix.

OR

3. Find the rank of the matrix by reducing to normal form $\begin{bmatrix} 1 & 2 & 3 & -1 \\ -1 & -1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$

UNIT-II

4. Show that the matrix $A=\begin{bmatrix} o & c & -b \\ -c & o & a \\ b & -a & o \end{bmatrix}$ satisfies Cayley – Hamilton Theorem and hence find A^{-1} if it exists.

OR

5. Find all the eigen values and the Corresponding eigen vectors of $\begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$

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UNIT-III

6. If $U = x + 3y^2 - z^3$, $V = 4x^2yz$, $W = 2z^2 - xy$, find $\frac{\partial(U,\ V,\ W)}{\partial(x,\ y,\ z)}$ at (1, -1, 0).

OR

7. Show that for x > 0, $\frac{x}{1+x} < \log(1+x) < x$, using Lagrange's mean value theorem

UNIT-IV

8. Solve: $(8xy - 9y^2)\,dx + 2(x^2 - 3xy)\,dy = 0$

OR

9. Find the orthogonal trajectory of the family of Coaxial Circle $x^2 + y^2 + 2\lambda x + C = 0$. Where λ being the Parameter.

UNIT-V

10. Solve $[D^2 - 4D + 4]y = e^{2x} + \cos 2x + 4$

OR

11. Using Variation of Parameters, solve $(D^2 - 2D + 1)\,y = e^x$.

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