R09

Code No: 09A30101

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B.Tech II Year I Semester Examinations, May/June-2013
Mathematics-II
(Common to CE, CHEM, MMT, AE, BT, PE)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) If A and B are two non-singular square matrices of the same order, then prove that $(AB)^{-1} = B^{-1}A^{-1}$.

b) Find the values of λ and μ so that the system of equations $2x + 3y + 5z = 9$, $7x + 3y - 2z = 8$, $2x + 3y + \lambda z = \mu$ has:
i) Unique solution. ii) No solution iii) Infinite number of solutions. [7+8]

2.a) If $\lambda_1, \lambda_2, ---- \lambda_n$ are the Eigen values of a matrix A then A^{-1} has the Eigen values $\frac{1}{\lambda_1}, \frac{1}{\lambda_2}, ----, \frac{1}{\lambda_n}$.

b) Use Cayley - Hamitton theorem to find A^3 and A^{-3} if $A = \begin{bmatrix} 2 & 4 \\ 1 & 1 \end{bmatrix}$. [7+8]

3.a) Prove that the Eigen values of an orthogonal matrix are of unit modulus.

b) Determine the values of a, b, c when $\begin{bmatrix} 0 & 2b & c \\ a & b & -c \\ a & -b & c \end{bmatrix}$ is orthogonal. [7+8]

4.a) Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz - 2zx - 2xy$ into canonical form by using orthogonal transformation.

b) Identify the nature, index and signature of the quadratic form $2x_1x_2 + 2x_2x_3 + 2x_3x_1$. [8+7]

5. Obtain the Fourier series for the function $f(x) = x^2$, $-\pi < x < \pi$. Hence show that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + --- = \frac{\pi^2}{8}$. [15]

6.a) Form the partial differential equations by eliminating arbitrary constants from the following: $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$.

b) Solve $z = px + qy + c\sqrt{(1 + p^2 + q^2)}$. [7+8]

7. Solve $\frac{\partial^2 y}{\partial t^2} = a^2 \frac{\partial^2 y}{\partial x^2}$ by the method of separation of variables. [15]

8.a) Find the Fourier transform of $f(x) = \begin{cases} 1 & if \ |x| < a \\ 0 & if \ |x| \geq a \end{cases}$ where 'a' is a '+'ve real number and hence deduce that $\int_0^\infty \frac{\sin t}{t} dt = \frac{\pi}{2}$.

b) Evaluate $\int_0^\infty \frac{dx}{(a^2+x^2)(b^2+x^2)}$ using transforms. [8+7]

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