Code No:43063
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
II.B.TECH - I SEMESTER REGULAR EXAMINATIONS NOVEMBER, 2009
MATHEMATICS-II
(Common to CE, CHEM, MMT, AE, BT)

Time: 3hours   **Max.Marks:80**

Answer any FIVE questions
All questions carry equal marks
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1. a) Find the rank of the matrix.

$$A = \begin{pmatrix} 2 & 1 & 2 & 1 \\ 4 & 3 & 3 & -3 \\ 2 & 2 & -1 & 1 \\ 6 & -6 & 6 & 12 \end{pmatrix}$$ by reducing it to normal form

   b) Test for consistency of the equation

$$2x - 3y + 7z = 5$$
$$3x + y - 3z = 13$$
$$5x - 2y + 4z = 18$$

   And hence solve them.   [8+8]

2. Verify Ceyley-Hamilton theorem for the matrix

$$\begin{pmatrix} 2 & -1 & 1 \\ 1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$$ and find its inverse.   [16]

3. a) Find a, b, c, so that the matrix.

$$A = \begin{pmatrix} 0 & 2b & c \\ a & b & -c \\ a & -b & c \end{pmatrix}$$ is orthogonal.

   b) Find the nature, index and signature of the quadratic form
$$2x_1x_2 + 2x_1x_3 + 2x_2x_3.$$ [8+8]

4. Develop Fourier series for the function
   f(x) = $x + x^2 in -\pi < x < \pi$. Hence deduce that
$$\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots \dots \dots \infty = \frac{\pi^2}{6}.$$ [16]

5. a) Eliminate the arbitrary function f from $Z = f\left(\dfrac{y}{x}\right)$ and form a, P, D , E .

   b) Find the complete integral yzp +zxq = xy

   c) Find the complete integral Z= $p^2 - q^2$ [5+5+6]

6. Solve by the method of separation of variable the PDES.

   a) $\mu_{xx} = \mu_y + 2\mu$

   b) $\mu_x = 4\mu_y$ and $\mu(0, y) = 8e^{-3y}$ [8+8]

7. a) Find the Fourier transform of $f(x) = \begin{cases} x \, if \, |x| \le a \\ 0 \, if \, |x| > a \end{cases}$

   b) Find the sin transform of f(x) = $\begin{cases} \cos x \, if \, 0 < x < a \\ 0 \, if \, x \ge a \end{cases}$ [8+8]

8. a) State and prove Damping rule

   b) Find $z\{1\}$

   c) Find $z^{-1}\left\{\dfrac{z}{z^2 + 7z + 10}\right\}$ [5+5+6]

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