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 $A= \begin{pmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \\ 4 & 1 & 4 & 4 \end{pmatrix}$ by reducing it to normal form

   b) Test for consistency and solve the following equation
   $$x + y + z = 3$$
   $$x + 2y + 3z = 4$$ [8+8]
   $$x + 4y + 9z = 6$$

2. Verify Cayley- Hamilton theorem for the matrix $A = \begin{pmatrix} 1 & 2 & 4 \\ -1 & 0 & 3 \\ 3 & 1 & -2 \end{pmatrix}$ and hence find A^{-1}

and A^4 .   [16]

3. a) Prove that the matrix $A= \dfrac{1}{3}\begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{pmatrix}$ is orthogonal

   b) Find the nature, index and signature of   [8+8]
   $$x_1^2 + 2x_2^2 + 3x_2^2 + 3x_3^2 + 2x_2x_3 - 2x_3x_1 + 2x_1x_2$$

4. a) Find Fourier series for $\sqrt{1 - \cos x}$ for $-\pi \le x \le \pi$
   b) Find the half-range cosine series for $f(x) = x \ in \ 0 < x < T$.   [8+8]

5. a) Form the partial differential equation by eliminating the ability function of from the relation
   $$z = y^2 + 2f\left(\frac{1}{x} + \log y\right)$$
   b) Solve PDE where $(x + y)zp + (x - y)zq = x^2 + y^2$.   [8+8]

6. Solve the following partial differential equation by the method of separation of variables.
  a) $4\mu_x + \mu_y = 3\mu$ and $\mu(0, y) = e^{-5y}$
  b) $Z_{xx} - 2z_x + z_y = 0$ [8+8]

7. a) Find the Fourier transform of
$$F(x) = \begin{cases} a^2 - x^2 & \text{if } |x| < a \\ 0 & \text{if } |x| \geq a \end{cases}$$
  b) Find the Fourier transformer of $e^{-ax} \sin ax$.   [8+8]

8. a) Find i) $z\{(-a^n)\}$ ii) $z\{na^n\}$
  b) If $z(\mu_n) = \overline{\mu}(z)$ prove that $z(a^{-n}\mu_n) = \overline{\mu}(az)$ [8+8]

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