Code No: R5210101 **R5**

II B.Tech I Semester(R05) Supplementary Examinations, May/June 2010
MATHEMATICS-II
(Common to Civil Engineering and Mechanical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) For what value of K the matrix $\begin{bmatrix} 4 & 4 & -3 & 1 \\ 1 & 1 & -1 & 0 \\ K & 2 & 2 & 2 \\ 9 & 9 & K & 3 \end{bmatrix}$ has rank 3.
   (b) Find whether the following set of equations are consistent if so, solve them.
   $x_1 + x_2 + x_3 + x_4 = 0$
   $x_1 + x_2 + x_3$ - $x_4 = 4$
   $x_1 + x_2$ - $x_3 + x_4 =$ -4
   x_1 - $x_2 + x_3 + x_4 = 2$. [8+8]

2. (a) Find the eigen values and the corresponding eigen vectors of $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$
   (b) Prove that the product of the eigen values is equal to the determinent of the matrix. [10+6]

3. (a) Prove that every square matrix can be uniquely expresses as a sum of symmetric and skew symmetric matrices.
   (b) Find the nature of the quadtratic form index and signature.
   $10x^2 + 2y^2 + 5z^2$ - 4xy - 10xz + 6yz. [8+8]

4. (a) Obtain a Fourier expansion for $\sqrt{1-\cos x}$ in the interval $-\pi <$ x $<\pi$
   (b) Represent the following function by a Fourier sin series $f(t) = \begin{cases} t, 0 < t \leq \frac{\pi}{2} \\ \frac{\pi}{2}, \frac{\pi}{2} < t \leq \pi \end{cases}$ [10+6]

5. (a) Form the partial differential equation by eliminating the arbitrary function from z = f($x^2 + y^2 + z^2$).
   (b) Solve the partial differential equation $\left(y^2+z^2\right)p - xyq = -xz$
   (c) Solve the partial differential equation $\left(y^2+z^2-x^2\right)p - 2xyq = -2zx$. [5+5+6]

6. A bar 100 cm long, with insulated sides, A and B has its ends kept at 0^o c and 100^o c until study state conditions prevail. The temperature of the end B is reduced to 80^o c and kept so while the end A is raised to 40^o C. Find the temperature distribution. [16]

7. (a) Find the Fourier cosine transforms of e^{-ax} cos ax.
   (b) Prove that the Fourier transform of the convolution of f(x) and g(x) is the product of their Fourier transforms. [8+8]

8. (a) If $Z(n^2) = \frac{z^2+z}{(z-1)^3}$, find $Z(n^3)$ and $Z(n^4)$
   (b) Using convolution theorem find $Z^{-1}\left[\frac{z^2}{(z-4)(z-5)}\right]$. [8+8]

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