Code: R7210101

R7

B.Tech II Year I Semester (R07) Supplementary Examinations, May 2013

MATHEMATICS - II
(Common to CE and BT)

Time: 3 hours Max Marks: 80

Answer any FIVE questions
All questions carry equal marks
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1 (a) Reduce the matrix A to the normal form of PAQ and hence find its rank given:

$$A = \begin{bmatrix} 3 & 2 & -1 & 5 \\ 5 & 1 & 4 & -2 \\ 1 & -4 & 11 & -19 \end{bmatrix}.$$

(b) Find the values of λ for which equations:
$(\lambda-1)x+(3\lambda+1)y+2\lambda z=0$,
$(\lambda-1)x+(4\lambda-2)y+(\lambda+3)z=0$,
$2x+(3\lambda+1)y+3(\lambda-1)z=0$,
are consistent, and find the ratios of $x:y:z$ when λ has the smallest of these values. What happens when λ has the greater of these values.

2 (a) If λ is the eigen values of matrix A, then prove that eigen values of $A^{-1} is \frac{1}{\lambda}$.

(b) Show that the matrix $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ is diagonalizable.

3 (a) Show that the matrix $\begin{bmatrix} \cos\phi & 0 & \sin\phi \\ \sin\theta\sin\phi & \cos\theta & -\sin\theta\cos\phi \\ -\cos\theta\sin\phi & \sin\theta & \cos\theta\cos\phi \end{bmatrix}$ is an orthogonal matrix.

(b) Reduce the quadratic form $3x^2+3y^2+3z^2+2xy+2xz-2yz$ to canonical form by orthogonal transformation.

4 (a) Find the Fourier series for $f(x)=e^{-x}\ in\ 0<x<2\pi$.

(b) Find the half-range sine series for $f(x)=\cos x\ in\ (0,\pi)$.

5 (a) Form the partial differential equation by eliminating the arbitrary function from the following:
(i) $z=xy+f(x^2+y^2)$ (ii) $lx+my+nz=f(x^2+y^2+z^2)$

(b) Solve: $px^2+qy^2=z^2$.

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6 (a) Solve by the method of separation of variables $2x\,\frac{\partial z}{\partial x} - 3y\,\frac{\partial z}{\partial y} = 0$.

(b) A tightly stretched string with fixed and points $x = 0$ and $x = l$ is initially at rest in its equilibrium. If it is vibrating by giving to each of its points a velocity $\mu x(l - x)_1$ find the displacement of the string at any distance x from one and at any time f.

7 (a) Express the function $f(x) = \begin{cases} 1, & |x| \leq | \\ 0, & |x| > | \end{cases}$ as Fourier integral.

Hence evaluate $\int_0^{\infty} \frac{sin\lambda\, cos\lambda x}{\lambda}\, d\lambda$.

(b) Find the sine and cosine transform of $2e^{-3x} + 3e^{-2x}$.

8 (a) Find: (i) $z\left[cos\,\frac{n\pi}{2}\right]$. (ii) $z\left[\sin\frac{n\pi}{2}\right]$. (iii) $z^{-1}\left[\frac{z+2}{z^2-5z+6}\right]$.

(b) Solve: $y_{n+2} - 7\,y_{n+1} - 8\,y_n = 2^n\,n^2\ by\ \ z - transform$.

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