

II B.Tech I Semester(RR) Supplementary Examinations, May/June 2010
MATHEMATICS-II

(Common to Civil Engineering, Electrical & Electronic Engineering, Mechanical Engineering, Electronics & Communication Engineering, Computer Science & Engineering, Electronics & Instrumentation Engineering, Bio-Medical Engineering, Information Technology, Electronics & Control Engineering, Computer Science & Systems Engineering, Electronics & Computer Engineering and Instrumentation & Control Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Find the rank of the matrix by reducing it to the normal form. [8]

$$\begin{bmatrix} 6 & 1 & 3 & 8 \\ 4 & 2 & 6 & -1 \\ 10 & 3 & 9 & 7 \\ 1b & 4 & 12 & 15 \end{bmatrix}$$

- (b) Find whether the following set of equations are consistent if so, solve them. [8]

$$2x - y + 3z - 9 = 0$$

$$x + y + z = 6$$

$$x - y + z - 2 = 0$$

2. Diagonalize the matrix A where $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & -1 \\ 0 & -1 & 3 \end{bmatrix}$ [16]

3. (a) Define : [6]
- Spectral Matrix
 - Quadratic Form
 - Canonical form.

- (b) Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to the canonical form. [10]

4. (a) Define a periodic function. Find the Fourier expansion for the function $f(x) = x - x^2$, $-1 < x < 1$. [10]

- (b) Prove that the function $f(x) = x$, $0 \leq x \leq \pi$ can be expanded in a series of sines as $x = 2 \left[\frac{\sin x}{1} - \frac{\sin 2x}{2} + \frac{\sin 3x}{3} - \dots \right]$. [6]

5. (a) Form the partial differential equation by eliminating the arbitrary function f from $xy + yz + zx = f(z / (x+y))$. [5]

- (b) Solve the partial differential equation $(3z - 4y)p + (4x - 2z)q = 2y - 3x$. [6]

- (c) Solve the partial differential equation $(y^2 + z^2)p - xyq + zx = 0$. [5]

6. Solve the boundary value problem

$$u_{tt} = a^2 u_{xx}; \quad 0 < x < L; \quad t > 0$$

$$\text{with } u(0, t) = 0; \quad u(L, t) = 0 \text{ and}$$

$$u(x, 0) = 0; \quad u_t(x, 0) = \sin^3(\pi x / L).$$

[16]

7. Solve $\frac{\partial u}{\partial t} = 2 \frac{\partial^2 u}{\partial x^2}$, $0 < x < 4, t > 0$ using Transformrs

$$\text{given } u(0, t) = 0, \quad u(4, t) = 0,$$

$$u(x, 0) = 3 \sin \pi x - 2 \sin 5 \pi x.$$

[16]

8. (a) Find the Z transform of $\sin(3n+5)$ [8]

- (b) Find $Z^{-1} \left[\frac{z}{z^2 + 11z + 24} \right]$ [8]
