

**II B.Tech I Semester Supplementary Examinations, May 2005**  
**MATHEMATICS-II**  
 ( Common to Civil Engineering,Electrical & Electronic  
 Engineering,Mechanical Engineering,Electronics & Communication  
 Engineering,Computer Science & Engineering,Chemical  
 Engineering,Electronics & Instrumentation Engineering,Bio-Medical  
 Engineering,Information Technology,Electronics & Control  
 Engineering,Mechatronics,Metallurgy & Material Technology and  
 Production Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE Questions  
 All Questions carry equal marks

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1. (a) Find the rank of the following matrix A by reducing it to the normal form, where

$$A = \begin{bmatrix} 1 & 2 & -1 & 3 \\ 4 & 1 & 2 & 1 \\ 3 & -1 & 2 & 1 \\ 1 & 2 & 0 & 1 \end{bmatrix}$$

- (b) Find whether the following system of equations are consistent, if so solve them.  
 $x + y + z = 6$ ,  $x - y + 2z = 5$ ,  $3x + y + z = 8$ .

2. Find the eigen values and the corresponding eigen vectors of the following matrix.

$$\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$$

3. (a) IF  $\lambda_1, \lambda_2, \dots, \lambda_n$ , are eigen values of a matrix A of order n. Prove that

i.  $\frac{1}{\lambda_1}, \frac{1}{\lambda_2} \dots \frac{1}{\lambda_n}$  are eigen values of  $A^{-1}$

ii.  $\lambda_1^m, \lambda_2^m \dots \lambda_n^m$  are eigen values of  $A^m$ ,

- (b) Reduce the quadratic form  $2x_1x_2 + 2x_2x_3 + 2x_1x_3$  to the canonical form.

4. (a) Obtain the Fourier series for  $f(x) = x - x^2$  in  $[-\pi, \pi]$ .

- (b) Obtain half range Fourier series for  $f(x) = 2x - 1$ ,  $0 < x < L$ .

5. (a) Form the partial differential equation by eliminating the arbitrary constants

$$z = x^2 + 2g\left(\frac{1}{y} + \log x\right).$$

- (b) Solve the partial differential equation  $p^2 + q^2 = z$ .

6. Solve the following partial differential equations:

(a)  $q^2 y^2 = z(z - px)$

(b)  $(x-y)p + (y-x-z)q = z$ .

7. Solve the following linear partial differential equations.

(a)  $(D^2 + DD' - 6D'^2)z = y \cos x$

(b)  $(D^2 + 4DD' - 4D'^2)z = e^{2x+y}$ .

8. A tightly stretched string with fixed end points  $x = 0$  and  $x = L$  is initially in a position given by  $u = u_0 \sin^3 \left( \frac{\pi x}{L} \right)$  if it is released from rest, from this position, find the displacement  $u(x, t)$ .

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