

**II B.Tech I Semester Supplementary Examinations, November 2006**  
**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, Computer  
 Science & Systems Engineering, Electronics & Telematics, Metallurgy &  
 Material Technology, Electronics & Computer Engineering, Production  
 Engineering and Aeronautical Engineering)

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. (a) Find the inverse of the matrix by elementary row transformations. [8]

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

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

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

$$3x - y + 2z = 1$$

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

$$x - y + z = -1.$$

2. Show that the matrix  $A = \begin{bmatrix} 1 & -2 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & 2 \end{bmatrix}$  Satisfies its characteristic equation. Hence

Find  $A^{-1}$  [16]

3. (a) Prove that the inverse of an orthogonal matrix is orthogonal and its transpose is also orthogonal. [8]

- (b) Show that  $A = \frac{1}{2} \begin{bmatrix} -1 & 1 & 1 & 1 \\ 1 & -1 & 1 & 1 \\ 1 & 1 & -1 & 1 \\ 1 & 1 & 1 & -1 \end{bmatrix}$  is orthogonal. [8]

4. (a) Show that for  $-\pi < x < \pi$ ,  
 $\text{Sin}x = \frac{2\text{sin}a\pi}{\pi} \left[ \frac{\text{sin}x}{1^2-a^2} - \frac{2\text{sin}2x}{2^2-a^2} + \frac{3\text{sin}3x}{3^2-a^2} - \dots \right]$  [6]

- (b) Find the half range cosine series for the function  $f(x) = (x-1)^2$  in the interval  
 $0 < x < 1$  Hence show that  $\sum_{n=1}^{\infty} \frac{1}{(2n-1)^2} = \frac{\pi^2}{8}$ . [10]

5. (a) Form the partial differential equations by eliminating the arbitrary functions  
 $Z = y^2 + 2f(1/x + \log y)$  [5]
- (b) Solve the partial differential equation  $(x^2 - y^2 - z^2)p + 2xyq = 2xz$ . [6]
- (c) Solve the partial differential equation  $z^2(p^2x^2 + q^2) = 1$ . [5]
6. Solve  $\delta^2 u / \delta x^2 + \delta^2 u / \delta y^2 = 0$ . Subject to the boundary conditions  $u(0, y) = u(L, y)$   
 $= u(x, 0) = 0$  and  $u(x, 0) = \sin \pi x / L$ . [16]
7. (a) Find the finite Fourier sine and cosine transforms of  $f(x) = x$  in  $(0, 1)$  [8]
- (b) Prove that  $\frac{1}{\sqrt{x}}$  is self reciprocal under Fourier sine and cosine transforms [8]
8. (a) State and prove final value theorem [6]
- (b) Using Z-transform solve  $4u_n - u_{n+2} = 0$  given that  $u_0 = 0, u_1 = 2$ . [10]

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