Code No: R5100204 **R5**

B.TECH. I Year(R05) Supplementary Examinations, May/June 2010
MATHEMATICAL METHODS
(Common to Electrical & Electronic Engineering, Electronics & Communication Engineering, Computer Science & Engineering, Electronics & Instrumentation Engineering, Bio-Medical Engineering, Information Technology, Electronics & Control Engineering, Computer Science & Systems Engineering and Electronics & Computer Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Find a real root of x tan$x$+1=0 using Newton Raphson method.
   (b) Find the unique polynomial P(x) of degree 2 or less such that P(1)=1, P(3)=27, P(4)=64 using Lagrange interpoaltion formula and Newton divided difference formula. [8+8]

2. (a) Derive normal equations to fit the parabola y=a+bx+cx^2
   (b) Given that

X	4.0	4.2	4.4	4.6	4.8	5.0	5.2
log(x)	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487

   Evaluate $\int_4^{5.2} \log x\, dx$ by Simpsons 3/8 rule. [8+8]

3. Find y(.2) and y(.4) using Taylor's series method given that $\frac{dy}{dx} = xy^2 + 1$ and y(0)=1 [16]

4. (a) Determine whether the following equations will have a non-trivial solution. If so solve them.
$$3x + 4y - z - 6w = 0; \quad 2x + 3y + 2z - 3w = 0$$
$$2x + y - 14z - 9w = 0; \quad x + 3y + 13z + 3w = 0.$$
   (b) Solve the tridiagonal system
   $3x_1 - x_2 = 4$,
   $2x_1 - x_2 + x_3 = 6$,
   $2x_2 + 3x_3 + 2x_4 = 11$,
   $x_3 - 2x_4 = -1$
   by writing the coefficient matrix as a product of a lower triangular and upper triangular matrices. [8+8]

5. (a) Find the eigen values and the corresponding eigen vectors of the matrix. $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$
   (b) If A and B are n rowed square matrices and if A is invertible show that A^{-1} B and BA^{-1} have the same eigen values. [10+6]

6. (a) Prove that the matrix $\frac{1}{3}\begin{bmatrix} -1 & 2 & -2 \\ -2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ is orthogonal.
   (b) Find the eigen values and the corresponding eigenvectors of the matrix [8+8]
   $\begin{bmatrix} 2-i & 0 & i \\ 0 & 1+i & 0 \\ i & 0 & 2-i \end{bmatrix}$

7. (a) Expand f(x) = cos ax as a Fourier series in $(-\pi, \pi)$ where a is not an integer. Hence prove that cot$\theta = \frac{1}{\theta} + \frac{2\theta}{\theta^2-\pi^2} + \frac{2\theta}{\theta^2-4\pi^2} + \ldots\ldots\ldots\ldots$
   (b) If the Fourier transform of f(t), F[f(t)]=f(s) then prove that $F\left[t^n f(t)\right] = (-1)^n \frac{d^n}{ds^n}\left(f(s)\right)$ [8+8]

8. (a) Form the partial differential equation by eliminating the arbitrary constants from $(x-a)^2 + (y-b)^2 + z^2 = r^2$
   (b) Solve the partial differential equation $z^2(p^2 + q^2) = x^2 + y^2$
   (c) Find the Z – transform of sinαk, $\quad k \geq 0$ [5+6+5]

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