Code No: R05010202 **R05**

I B.Tech Examinations,May/June 2012
MATHEMATICAL METHODS
Common to BME, IT, ICE, E.COMP.E, ETM, E.CONT.E, EIE, CSE, ECE, CSSE, EEE

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Represent the following function by a Fourier sine series. $f(t) = \begin{cases} t, & 0 < t \leq \frac{\pi}{2} \\ \frac{\pi}{2}, & \frac{\pi}{2} < t \leq \pi \end{cases}$

   (b) Using Fourier integral theorem prove that $e^{-ax} - e^{-bx} = \frac{2(b^2 - -a^2)}{\pi} \int\limits_0^\infty \frac{\lambda \sin \lambda x \, d\lambda}{(\lambda^2+a^2)\,(\lambda^2+b^2)}$ [8+8]

2. (a) Find a root of cos x–x^2–x=0 using Regula falsi method.

   (b) Consider the following table for f(x)

x :	0	10	20	40	50	60
f(x) :	6	70	75	18	24	90

   Calculate f(30) from the above table, using Lagrange Formula. [8+8]

3. (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]
   $\begin{bmatrix} 2-i & 0 & i \\ 0 & 1+i & 0 \\ i & 0 & 2-i \end{bmatrix}$

4. (a) Fit a straight line y=a+bx from the following data.

x	1	2	3	4	5
y	5	7	9	10	11

   (b) Evaluate $\int\limits_0^1 \frac{dx}{1+x^2}$ using simpson's $\frac{1}{3}rd$ rule taking h=0.1. [8+8]

5. Use Euler's modified method to find y(1.1), y(1.2) and y(1.3) correct to three decimal places given $\frac{dy}{dx} = xy^{1/3}$, y(1) =1. [16]

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

   (b) Solve the partial differential equation (2z – y) p + (x + z) q + (2 x + y) = 0.

   (c) Solve the difference equation, using Z - transforms
   $y_{n+2} - 4y_{n+1} + 3y_n = 0$ given that
   $y_0 = 2$ and $y_1 = 4$. [5+5+6]

7. (a) Find the rank of the matrix.

$$A = \begin{bmatrix} 2 & -2 & 0 & 6 \\ 4 & 2 & 0 & 2 \\ 1 & -1 & 0 & 3 \\ 1 & -2 & 1 & 2 \end{bmatrix}$$ by reducing it to the normal form.

(b) Test for consistency the set of equations and solve them if they are consistent.

$x + 2y + 2z = 2$
$3x - 2y - z = 5$
$2x - 5y + 3z = -4$
$x + 4y + 6z = 0$ [8+8]

8. Define a modal matrix Diagonalize $A = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$

Also find the matrix of the Linear transformation which is responsible for diagonalization. [16]

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