Code No: 51008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B.Tech I Year Examinations, June - 2015
MATHEMATICAL METHODS
(Common to EEE, ECE, CSE, EIE, BME, IT, ETM)

Time: 3 hours — Max. Marks: 75

Answer any five questions
All questions carry equal marks

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1.a) Find the Half range Fourier Sine series of f(x)= Cos x in $0 < x < \pi$.

  b) Find the Fourier series of $f(x) = x - x^2$ defined in the interval $(-\pi, \pi)$. [7+8]

2.a) Form the P.D.E by eliminating the arbitrary function $f(x^2 + y^2 + z^2, ax + by + cz) = 0$.

  b) A square plate is bounded by the lines x=0, y=0, x=20 and y=20. Its faces are insulated. The temperature along the upper horizontal edge is given by u(x,20)=x(20-x), 0<x<20 while the other three edges are kept at 0^0C. Find the steady state temperature distribution. [7+8]

3.a) Solve by LU decomposition method:
20x+ y- 2z = 17, 3x+ 20y –z = -18, 2x- 3y +20z = 25.

  b) Reduce the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$ into Normal form hence find its rank. [7+8]

4.a) Find the Eigen values and Eigen Vectors of $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$.

  b) Using Cayley-Hamilton Theorem and find A^{-1}, where $A = \begin{bmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}$. [7+8]

5.a) Reduce the quadratic form $3x_1^2 + 3x_2^2 + 3x_3^2 + 2x_1x_2 + 2x_1x_3 - 2x_2x_3$ to canonical form by orthogonal transformation. Find rank, index and signature of the quadratic form.

  b) Show that all the characteristic roots of a Hermitian matrix are real. [7+8]

6.a) Using Newton's Raphson method find square root of 41.

  b) The population of certain town is shown in the following table. Estimate the population in 1936.

year	1921	1931	1941	1951	1961
Population in 1000's	19.96	39.65	58.81	77.21	94.61

[7+8]

7.a) Fit a curve $y = ae^{bx}$ to the following data:

x	0	1	2	3	4	5	6	7	8
y	20	30	52	77	135	211	326	550	1052

b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's rule and trapezoidal rule and hence find the approximate value of π. [7+8]

8. Using Modified Euler's method find y(0.1) and y(0.2), given that $y' = x - y$ and y(0) = 1 and compare the results with exact solutions. [15]

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