

Code No: 51008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, December - 2017

MATHEMATICAL METHODS

(Common to EEE, ECE, CSE, EIE, BME, IT)

Time: 3 hours

Max. Marks: 75

Answer any five questions  
All questions carry equal marks

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- 1.a) Reduce the matrix  $A = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 2 & 0 & 1 \\ 1 & 4 & 5 & -1 \end{pmatrix}$  to normal form and hence find its rank.
- b) Solve the system of equations  $3x+2y+7z=4$ ,  $2x+3y+z=5$ ,  $3x+4y+z=7$  using LU decomposition method. [7+8]
- 2.a) If  $\lambda$  is an Eigen value of a non-singular matrix  $A$ , then show that  $\frac{1}{\lambda}$  is an Eigen value of  $A^{-1}$  and  $\frac{|A|}{\lambda}$  is an Eigen value of  $Adj A$ .
- b) Diagonalize the matrix  $A = \begin{pmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{pmatrix}$ . [5+10]
- 3.a) Express the matrix  $A = \begin{pmatrix} 2 & 3 & -1 \\ -1 & 4 & 1 \\ 5 & 0 & 6 \end{pmatrix}$  as the sum of a symmetric matrix and a skew-symmetric matrix.
- b) Find the rank, index, nature and signature of the quadratic form  $Q = 2(xy + yz + zx)$ .
- c) Prove that all the Eigen values of a Hermitian matrix are real. [5+5+5]
- 4.a) Find a positive root of the equation  $x^3 - 4x - 9 = 0$  correct to three decimal places by bisection method.
- b) Apply Lagrange's interpolation formula to find  $f(10)$  and  $f(10.5)$  from the table given below. [7+8]

x :	5	6	9	11
f(x):	12	13	14	16

5.a) Find  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  at  $x=0$  from the following table.

x:	0	1	2	3	4	5
y:	4	8	15	7	6	2

b) Fit an exponential curve of the form  $y = ae^{bx}$  to the following data:

x:	1	2	3	4
y:	7	11	17	27

[7+8]

6.a) Find the approximate value of  $y(0.2)$  for  $y' = x + y^2$ ,  $y(0) = 1$  using Taylor's series method.

b) Given  $y' = \frac{y-x}{y+x}$ ,  $y(0) = 1$ . Compute  $y(0.1)$  by Euler's method with  $h = 0.02$ . [7+8]

7.a) Find the Fourier series to represent the function  $f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$  and hence

deduce that  $1 + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$ .

b) Obtain the half-range Fourier cosine series for the function  $f(x) = x$  in  $(0, \pi)$ . [10+5]

8.a) Form a partial differential equation by eliminating the arbitrary functions  $f$  and  $g$  from  $z = y f(x) + x g(y)$ .

b) Solve  $yzp + xzq = xy$ .

c) Solve  $p + q = pq$ .

[5+5+5]

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