JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, December - 2017
MATHEMATICAL METHODS
(Common to EEE, ME, ECE, CSE, IT)

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

Answer any five questions
All questions carry equal marks
- - -

1.a)   Find the rank of a matrix $\begin{bmatrix} 0 & 2 & 8 & 1 \\ 0 & 1 & 2 & 1 \\ 0 & 8 & 1 & 6 \\ 0 & 1 & 0 & 1 \end{bmatrix}$ using Echelon from.

   b)   Solve $10x - 2y - 2z = 6$, $-x + 10y - 2z = 7$ and $-x - y + 10z = 8$ by using LU decomposition method.   [8+8]

2.a)   Find the Eigen values and Eigen vectors of $\begin{bmatrix} 3 & 2 & 2 \\ 1 & 2 & 1 \\ -2 & -2 & -1 \end{bmatrix}$.

   b)   Let λ is an Eigen value of non-singular matrix A, prove that Eigen value of $adj(A)$ is $\frac{|A|}{\lambda}$.
                                                                                         [8+8]

3.   Reduce the quadratic form $6x^2 + 3y^2 + 3z^2 - 2xy + 4zx - 4yx$ to the normal form by an orthogonal transformation and hence find its rank, index, signature and nature of the quadratic form. Also find the orthogonal transformation.   [16]

4.a)   Find a positive real root of the equation $x\sin x + \cos x = 0$, correct to four decimal places using False position method.
   b)   Define interpolation and Find the interpolate polynomial from the following data.

x	0	1	2	3	4
y	3	6	11	18	27

                                                                                         [8+8]

5.a)   Fit a straight line of the following data.

x	1	3	5	7	9
y	1.5	2.8	4.0	4.7	6.0

   b)   Evaluate $\int_0^2 \sin x^2 dx$ using Trapezoidal rule as well as Simpson's rule, taking step size h=0.2.   [8+8]

6.a) Using Euler's method, find the numerical solutions of $\frac{dy}{dx} = x^2 + y^2$, y(0)=1 for $x = 0$ to 1 with step size h=0.2.

b) Using Runge Kutta method of fourth order, find y(0.1) and y(0.2) from $\frac{dy}{dx} = x - y$, $y(0) = 1$. [8+8]

7.a) Let $\bar{f}_s(p)$ and $\bar{f}_c(p)$ are Fourier sine and cosine transform of $f(x)$, Prove that $F_c\{xf(x)\} = \frac{d}{dp}\bar{f}_s(p)$ and $F_s\{xf(x)\} = -\frac{d}{dp}\bar{f}_c(p)$.

b) Obtain the Fourier series expansion of f(x)= |x| in (- π, π) and hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + ...$ [8+8]

8.a) Form the partial differential equation by eliminating the arbitrary function f from $z = f(x^2 - y^2)$.

b) Solve $(p^2 + q^2)y = qz$

c) Find the Z-transformation of $na^n + 1, a > 0$. [16]

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