ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B. Tech II Semester Supplementary Examinations, August-2015
ENGINEERING MATHEMATICS-III
(Common to CE, ME, CSE, IT, ECE &EEE)

Time: 3 hours **Max Marks: 70**

PART- A

Answer all questions [10 x 1=10M]

1. a) Determine the rank of unit matrix of order 5(I_5).

b) Are there any linear systems without solution? with one solution? with more than one solution? Justify?

c) The eigen values of a matrix A=$\begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ are 1, 2, 3. Determine the eigen values of the matrix adjA.

d) Write the quadratic form corresponding to the symmetric matrix $\begin{bmatrix} 1 & 2 \\ 2 & -4 \end{bmatrix}$.

e) Is Fourier series exist for the periodic function f(x) = $\sqrt{x}$ in (0, 5)? If not give reasons.

f) If the Fourier transform of e^{-x^2} is $\sqrt{®}\,e^{-\frac{s^2}{4}}$, then find inverse Fourier transform of $e^{-\frac{s^2}{4}}$.

g) Find the Z-transform of sin (3n).

h) Find the inverse Z –transform of $\frac{z}{(z-1)^2}$.

i) Find $(1,2)$

j) Compute $\Gamma(\frac{1}{4})\Gamma(\frac{3}{4})$.

PART-B

Answer one question from each unit **[5 X 12 = 60 M]**

UNIT - I

2. a) Reduce the matrix $\begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$ in to its normal form and hence find its rank. [6M]

b) Find the values of a and b for which the equations x+ ay+ z = 3; x+2y+2z = b ; x+5y+3z = 9 are consistent. When will these equations have a unique solution? [6M]

(OR)

3. a) Reduce to echelon form and hence find the rank of the matrix A=$\begin{bmatrix} 1 & 2 & -4 & 5 \\ 2 & -1 & 3 & 6 \\ 8 & 1 & 9 & 7 \end{bmatrix}$. [6M]

b) Solve the system of equations 8y+2z=-7, 3x+5y+2z=8, 6x+2y+8z=26 by Gauss Elimination method. [6M]

UNIT-II

4. a) Two eigen values of the matrix $A=\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ are 1, 1. Find the eigen values of A^{-1}. [4M]

b) Find the characteristic equation of the matrix, $A=\begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ and hence compute by using Cayley's Hamilton Theorem. Also find the matrix represented by $A^8-5A^7+7A^6-3A^5+A^4-5A^3+8A^2-2A+I$. [8M]

(OR)

5. Reduce the quadratic form $3x^2+5y^2+3z^2-2xy-2xz+2yz$ into canonical form by orthogonal transformation. Also identify its nature, rank, signature and index. [12M]

UNIT-III

6. a) Expand the function f(x) as a Fourier series [8M]

$$f(x)=\begin{cases} -\pi ; & -\pi < x < 0 \\ x ; & 0 < x < \pi \end{cases}$$ and hence deduce that $1/1^2+1/3^2+1/5^2+\text{---------} = \pi^2/8$.

b) Find the Fourier transform of $f(x)=\begin{cases} 1-x^2; & |x|\le 1 \\ 0; & |x|>1 \end{cases}$ [4M]

(OR)

7. a) Expand f(x)= x as a half range cosine series in the interval $0< x < \pi$ and hence deduce $1/1^2+1/3^2+1/5^2+\text{---------} = \pi^2/8$. [6M]

b) Solve the integral equation [6M]

$$F_C(S)=\int_0^\infty f(t)\cos st\,dt=\begin{cases} 1-s, & 0\le s\le 1 \\ 0, & s>1, \end{cases} \quad \text{Hence evaluate } \int_0^\infty \frac{\sin^2 t}{t^2}dt$$

UNIT-IV

8. a) Evaluate u_3 from $U(z)=\dfrac{2z^2+5z+14}{(z-1)^4}$, by using initial value theorem. [6M]

b) Using Z-transform, solve the difference equation $u_{k+2} - 2u_{k+1} + 3u_k = 2^k$, with $u_0 = 2$, $u_1 = 1$. [6M]

(OR)

9. a) Using damping rule, show that $(i)\,Z(na^n)=\dfrac{az}{(z-a)^2}$ (ii) $Z(n^2a^n)=\dfrac{az^2+a^2z}{(z-a)^3}$ [6M]

b) Evaluate $Z^{-1}\left(\dfrac{z^2}{(z-4)(z-9)}\right)$, by using Convolution theorem. [6M]

UNIT-V

10. a) Define gamma function and evaluate $\Gamma(\frac{1}{2})$. [6M]

b) Show that $\displaystyle\int_0^\infty x^m e^{-a^2x^2}dx=\frac{1}{2a^{m+1}}\Gamma(\frac{m+1}{2})$. [6M]

(OR)

11. a) Show that $\displaystyle\int_0^1 \frac{x^4}{\sqrt{1-x^2}}dx=\frac{3®}{16}$. [6M]

b) Define beta function and show that $(m,n) = (n,m)$. [6M]