AR13 **Set-02**

Code: 13BS1003

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Supplementary Examinations, October, 2014
ENGINEERING MATHEMATICS-III
(Common to CE, ME, CSE, IT, ECE & EEE)

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

PART-A

Answer all questions **[10x1M=10M]**

1. a) Define rank of a matrix.
   b) When a system $AX = B$ have a solution.
   c) Write any two applications of Cayley-Hamilton theorem.
   d) Write Dirichlet conditions for Fourier series.
   e) State Fourier integral theorem.
   f) Write change of scale property for Fourier transforms.
   g) Find the *Z*-transform of unit step function.
   h) State damping rule for *Z*-transforms.
   i) Compute $\Gamma(3.5)$.
   j) State the relation between Beta and Gamma functions.

PART-B

Answer one question from each unit **[5x12=60M]**

Unit-I

2. a) Reduce the matrix $A = \begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$ to normal form and hence find its rank.

   b) Find the values of k for which the system of equations $(3k-8)x+3y+3z=0$, $3x+(3k-8)y+3z=0$, $3x+3y+(3k-8)z=0$ has non-trivial solution. [6M+6M]

(OR)

3. Investigate for what values of $\mathtt{a}$ and $\ll$ the following equations $2x+3y+5z=9$, $7x-3y-2z=8$, $2x+3y+\mathtt{a}z=\ll$, have (i) no solution (ii) a unique solution (iii) an infinite number of solutions. [12M]

Unit-II

4. Find the Eigen values and Eigen vectors of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$. [12M]

(OR)

5. Reduce the quadratic form $3x^2+5y^2+3z^2-2yz+2zx-2xy$ to the canonical form by an orthogonal reduction and discuss its nature. Also find the model matrix. [12M]

Unit-III

6. Find the Fourier series for the function $f(x)=\begin{cases}®x, & 0\le x\le 1\\ ®(2-x), & 1\le x\le 2.\end{cases}$ [12M]

(OR)

7. a) Find the Fourier expansion of $x\sin x$ as a cosine series in $(0, ®)$.

   b) Find the Fourier sine transform of $f(x)=\dfrac{e^{-ax}}{x}$. [6M+6M]

Unit-IV

8. a) Find the Z-transform of (i) ne^{an} (ii) $\dfrac{1}{(n+1)!}$.

   b) Solve: $y_{n+2}+6y_{n+1}+9y_n=2^n$ with $y_0=y_1=0$ using *Z*-transforms. [6M+6M]

(OR)

9. a) Find the inverse *Z*-transform of $\dfrac{5z}{(z-2)(3z-1)}$.

   b) If $U(z)=\dfrac{2z^2+5z+14}{(z-1)^4}$ then evaluate u_2 and u_3. [6M+6M]

Unit-V

10. a) Prove that $(m,\ n)=\int_0^{\infty}\dfrac{y^{n-1}}{(1+y)^{m+n}}dy$.

    b) Prove that $\Gamma(\frac{1}{2})=\sqrt{®}$. [6M+6M]

(OR)

11. a) Express the integral $\int_0^{\infty}a^{-bx^2}dx$ in terms of Gamma function.

    b) Prove that $\Gamma(n+\frac{1}{2})=\dfrac{\Gamma(2n+1)\sqrt{®}}{2^{2n}\Gamma(n+1)}$. [6M+6M]