AR13 **Set-02**

Code: 13BS1003

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Regular Examinations, August, 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 Normal form of a Matrix
b) When do you say that system of equations are consistent
c) Define Eigen values and Eigen vectors
d) State Cayley- Hamilton theorem
e) Write Eulers formula for Fourier series in $(\alpha, \alpha + 2\pi)$
f) Write Fourier Sine and Cosine integral formula
g) Write change of scale property for Z- Transforms
h) Evaluate $Z^{-1}\left[\left(\frac{z}{z-a}\right)^2\right]$
i) Compute $\Gamma(3.5)$
j) Prove that $\beta(m,n) = \beta(m+1,n) + \beta(m,n+1)$

Part-B

Answer one question from each unit **[5X12=60M]**

Unit-I

2. a) Reduce the following matrix into Echelon form and hence find its rank

$$A = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$$

b) Test for Consistency and solve
5x+3y+7z=4;3x+26y+2z=9;7x+2y+10z=5 [6M+6M]

(OR)

3. a) Determine the Rank of the matrix $\begin{bmatrix} 5 & 6 & 7 & 8 \\ 6 & 7 & 8 & 9 \\ 11 & 12 & 13 & 14 \\ 16 & 17 & 18 & 19 \end{bmatrix}$

b) Apply Gauss-Elimination method to solve the equations x+4y-z=-5; x+y-6z=-12; 3x-y-z=4 [6M+6M]

Unit-II

4. a) Find the Eigen values and Eigen vectors of the matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$

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 A^{-1}. Also express the polynomial $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$ as a polynomial in A. [6M+6M]

(OR)

5. Reduce the Quadratic form $2x_1x_2 + 2x_3x_3 - 2x_2x_3$ to a canonical form by an orthogonal reduction and discuss its nature. [12M]

Unit-III

6. a) Expand $f(x) = x \sin x$ as a Fourier series in $0 < x < 2\pi$

b) Find the Fourier cosine transform of $f(x) = \frac{1}{(1+x^2)}$ [6M+6M]

(OR)

7. a) Expand $f(x) = \begin{cases} \frac{1}{4} - x; if\ 0 < x < 1/2 \\ x - \frac{3}{4}; if\ \frac{1}{2} < x < 1 \end{cases}$ as a Fourier series in terms of Sine.

b) Find the Fourier transform of $f(x) = \begin{cases} 1\ for\ |x| < 1 \\ 0; for\ |x| > 1 \end{cases}$

Hence evaluate $\int_0^\infty \frac{\sin x}{x}\, dx$ [6M+6M]

Unit-IV

8. a) Find the Z- Transform of $n^2 e^{n\theta}$

b) Using Z-Transforms solve $y_{n+2} - 7y_{n+1} + 12y_n = 0$ given that $y(0) = 1$ and $y_1(0) = 2$

[6M+6M]

(OR)

9. a) Find $Z[Coshat.Sinbt]$

b) Find the inverse Z-Transform of $\frac{z}{(z-1)(z^2+1)}$ [6M+6M]

Unit-V

10. a) Show that $\beta(p,q) = \int_0^\infty \frac{y^{q-1}}{(1+y)^{p+q}}\, dy = \int_0^1 \frac{x^{p-1}+x^{q-1}}{(1+x)^{p+q}} dx$

b) Prove that $\int_0^1 \frac{x}{\sqrt{1-x^5}} dx = \frac{1}{5}\beta\left(\frac{2}{5}, \frac{1}{2}\right)$ [6M+6M]

(OR)

11. a) Prove that $\int_0^1 \frac{x^2}{\sqrt{1-x^4}} dx \times \int_0^1 \frac{dx}{\sqrt{1+x^4}} = \frac{\pi}{4\sqrt{2}}$

b) Express the integral $\int_0^\infty e^{-x^2}\, dx$ in terms of Gamma functions [6M+6M]