

I/IV B. TECH. DEGREE EXAMINATIONS, NOV / DEC - 2015**First Semester****BT / CSE / ECE / EEE****MATHEMATICS - I**Time : **Three Hours**Maximum Marks : **60****Answer Question No. 1 Compulsory.****12x1=12 M****Answer ONE question from each Unit.****4x12=48 M**

1. a) Define Echelon form of a matrix.

b) The latent roots of
$$\begin{bmatrix} 1 & 7 & 8 \\ 0 & 4 & 6 \\ 0 & 0 & 5 \end{bmatrix}.$$

- c) Define similarity of a matrix.
d) State Lagrange's Theorem.
e) Write meclaurin's series of e^x .
f) State the relation between Cartesian coordinates to cylindrical coordinates.
g) State the relation between Beta & Gamma functions.
h) State Euler's formula.
i) Even and Odd functions.

j) Change the order of integration
$$\int_0^{2a} \int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dy dx.$$

- k) Define error function.
l) Define even function.

UNIT - I

2. a) For what values of 'k' the equations
- $x+y+z = 1$
- ,
- $2x+y+4z = k$
- ,
- $4x+y+10z = k^2$
- have a solution and solve them completely in each case.

b) Using Cayley-Hamilton theorem, find the inverse of
$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ 2 & -4 & -4 \end{bmatrix}.$$

(OR)

3. a) Diagonalize the matrix $A = \begin{bmatrix} 8 & -8 & 2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$.

b) Show that $\begin{bmatrix} 3 & 7-4i & -2+5i \\ 7+4i & -2 & 3+i \\ -2-5i & 3-i & 4 \end{bmatrix}$ is a Hermitian matrix.

UNIT - II

4. a) Verify Rolle's theorem for $f(x) = \left\{ \frac{x^2 + ab}{x(a+b)} \right\}$ in (a,b).

b) Expand $\log(1+\sin^2x)$ in powers of x as far as the term in x^6 .

(OR)

5. a) The temperature T at any point (x, y, z) in space is $T = 400xyz^2$. Find the highest temperature on the surface of the unit sphere $x^2+y^2+z^2 = 1$.

b) Fit an equation of the form $y = a e^{bx}$ to the following data by method of least square :

| | | | | |
|-----|------|-----|-----|------|
| x | 1 | 2 | 3 | 4 |
| y | 1.65 | 2.7 | 4.5 | 7.35 |

UNIT - III

6. a) Compute the value of $\iint_R y \, dx \, dy$, where R is the region in the first quadrant bounded by

the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

b) Evaluate $\iiint \frac{dx \, dy \, dz}{\sqrt{1-x^2-y^2-z^2}}$, the integral being extended to the positive octant of

the sphere $x^2+y^2+z^2 = 1$.

(OR)

7. a) Find, by triple integration, the volume of a sphere of radius 'a'.

b) Derive the relation between Beta and Gamma functions.

UNIT - IV

8. a) Find the Fourier series expansion for the function

$$f(x) = \begin{cases} -x, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$$

- b) Find the half-range Cosine series for the function $f(x) = (x-1)^2$ in the interval $0 < x < 1$.

(OR)

9. a) Find the complex form of Fourier series for e^{-x} in $-1 < x < 1$.

- b) Find the Fourier sine series for unity in $0 < x < \pi$ and hence show that

$$1 + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \dots = \frac{\pi^2}{8}.$$

