Reg. No. | | | | | | | | | |

ANNA UNIVERSITY, CHENNAI - 600 025
B.E / B.TECH DEGREE END SEMESTER EXAMINATIONS – NOV / DEC 2011
FIRST SEMESTER, REGULATION - 2004
MA 171 - MATHEMATICS –I
(COMMON TO ALL BRANCHES)

Time : 3 Hours **Answer ALL Questions** **Max. Marks : 100**

Part A **(10 x 2 = 20)**

1. The product of two eigenvalues of the matrix $A=\begin{bmatrix} 6 & -2 & 2 \\ -3 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ is 16. Find the third eigenvalue.

2. Find the nature of the quadratic form $2x_1^2 + x_2^2 - 3x_3^2 + 12x_1x_2 - 8x_2x_3 - 4x_3x_1$.

3. Find the equation of the sphere whose centre is (1,-2,3) and which passes through the point (3,1,-3).

4. Find the equation of the sphere with centre at (1,2,3) which touches the z-axis .

5. Explain the monotonic sequence and what is the condition for convergence.

6. Examine the convergence of the series

$$1-\frac{1}{\sqrt{2}}+\frac{1}{\sqrt{3}}-\frac{1}{\sqrt{4}}+\frac{1}{\sqrt{5}}-\ldots\infty$$

7. Find $\frac{dy}{dx}$ using partial differentiation , if $x^3+3x^2y+6xy^2+y^3=1$.

8. If $u=2xy$, $v=x^2-y^2$, $x=r\cos\theta$, $y=r\sin\theta$ *then compute* $\frac{\partial(u,v)}{\partial(r,\theta)}$.

9. Find the particular integral of $(D^2+4)y=x^4$.

10. Convert the equation $xy''-3y'+x^{-1}y=x^2$ as a linear equation with constant coefficients.

Part-B **(5x16 = 80)**

11. i). Test the convergence of the series using D'Alembert's ratio test.

$$1+\frac{2}{5}x+\frac{6}{9}x^2+\frac{14}{17}x^3+....+\infty. \quad (8)$$

ii). State the values of x for which the following series converge.

$$x-\frac{x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}+\frac{x^5}{5}-....+\infty. \quad (8)$$

12. a.i). Find the eigenvalues and eigenvectors of the matrix $A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ (8)

ii). Using Cayley - Hamilton theorem , find the inverse of the given matrix

$$A=\begin{bmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix} \quad (8)$$

(OR)

b). Reduce the quadratic form $10x_1^2+2x_2^2+5x_3^2+6x_2x_3-10x_3x_1-4x_1x_2$ to a canonical form by orthogonal reduction. Find also a set of non-zero values of x_1 , x_2 , x_3 which will make the Q.F zero. (16)

13. a.i). Find the equation of the sphere passing through the four points (1,2,3) , (0,-2,4), (4,-4,2) and (3,1,4). (8)

ii). Find the equation of the sphere having the circle

$x^2+y^2+z^2+10y-4z-8=0$, $x+y+z=3$. as a great circle. (8)