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

END SEMESTER EXAMINATIONS – APRIL/MAY 2013
B.E/B.Tech- First Semester– (Regulation 2008)

(3)

MA 9111 MATHEMATICS-I

Time: 3 hours *Answer All Questions* Max Marks: 100

Part A (10x2=20)

1. If $A=\begin{pmatrix}1 & 2 & -3\\ 0 & 3 & 2\\ 0 & 0 & -2\end{pmatrix}$ then find the eigen value of $(A-3I)^2$.
2. Write the matrix of the quadratic form $4x_1x_3+2x_2x_3+x_3^2$.
3. Test the convergence of the sum $\frac{1}{1.3}+\frac{2}{3.5}+\frac{3}{5.7}+\frac{4}{7.9}+...$
4. Discuss the convergence of the series $2-\frac{3}{2}+\frac{4}{3}-\frac{5}{4}+.....\infty$.
5. If $x^3+y^3=3axy$, *find* $\frac{dy}{dx}$.
6. Find the Jacobian $\frac{\partial(u,v)}{\partial(r,\theta)}$, *where* $u=x^2-y^2, v=2xy$ *and* $x=r\cos\theta, y=r\sin\theta$.
7. Compute $\beta(\frac{9}{2},\frac{7}{2})$.
8. When does the improper integral of first type converge?
9. Sketch the region of integration $\int_0^{\frac{a}{\sqrt{2}}}\int_x^{\sqrt{a^2-x^2}} f(x,y)dxdy$.
10. Evaluate $\int_0^1\int_0^{1-x}\int_0^{x+y} e^z\,dxdydz$.

[P.T.O]

Part B (5X16=80)

11 (i) Find the Eigen value and Eigen vectors of the matrix

$$\begin{pmatrix} 11 & -4 & -7 \\ 7 & -2 & -5 \\ 10 & -4 & -6 \end{pmatrix}$$

(ii) Using Cayley- Hamilton theorem find the inverse of (8+8)

$$A = \begin{pmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{pmatrix}$$

12(a) (i) Test for convergence of the series $\sum_{1}^{\infty} \frac{\sqrt{n}}{n^2+1}$.

(ii) Test the series for Conditional Convergence

$$\frac{1}{2^3} - \frac{1}{3^3}(1+2) + \frac{1}{4^3}(1+2+3) - \frac{1}{5^3}(1+2+3+4) + \ldots\infty. \qquad (8+8)$$

[OR]

12(b) (i) Discuss the convergence of the series $1 + \frac{2!}{2^2} + \frac{3!}{3^3} + \frac{4!}{4^4} + \ldots\infty.$

(ii) Test the series $x - \frac{x^2}{\sqrt{2}} + \frac{x^3}{\sqrt{3}} - \frac{x^4}{\sqrt{4}} + \ldots\ldots$ for absolute convergence. (8+8)

13.(a) (i) Find the maximum or minimum vales of $3x^2 - y^2 + x^3$.

(ii) If $u = f(x^2 - y^2, y^2 - z^2, z^2 - x^2)$ *find* $\frac{1}{x}\frac{\partial u}{\partial x} + \frac{1}{y}\frac{\partial u}{\partial y} + \frac{1}{z}\frac{\partial u}{\partial z}$ (8+8)

[OR]

13.(b) i) Expand $e^x \sin y$ in powers of x and y as far as terms of the third degree.

(ii) Find the shortest and longest distance from the point (1,2,-1) to the

sphere $x^2 + y^2 + z^2 = 24$. (8+8)

[P.T.O]

14.(a) (i) Evaluate $\int_0^1 \frac{dx}{\sqrt{1-x^4}}$

(ii) Show that $\frac{\beta(m+1,n)}{m} = \frac{\beta(m,n+1)}{n} = \frac{\beta(m,n)}{m+n}$. (8+8)

[OR]

14. (b) (i) Evaluate $\int_0^\infty \frac{\tan^{-1}(ax)}{x(1+x^2)} dx$.

(ii) Show that $\int_0^1 x^m \left(\log \frac{1}{x}\right)^n dx = \frac{\Gamma(n+1)}{(1+m)^{n+1}}$. (8+8)

15. (a) (i) Change into polar coordinates and evaluate, $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dydx$

(ii) Change the order of integration and evaluate $\int_0^1 \int_{x^2}^{2-x} xydydx.$ (8+8)

[OR]

15. (b) (i) Find the area between the curves $y^2 = 4x$ *and* $2x-3y+4=0$.

(ii) Evaluate $\iiint \frac{dxdydz}{x^2+y^2+z^2}$ throughout the volume of the sphere

$x^2+y^2+z^2 = a^2$. (8+8)

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