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B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2013

COMMON TO ALL BRANCHES

Semester- 1

MA 131/MA 171/MA 9111 & MATHEMATICS-I

(Regulation 2002/2004/2008)

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

PART-A (10 x 2 = 20 Marks)

- Find the eigen values of the matrix $\begin{bmatrix} 1 & 7 & 8 \\ 0 & 1 & 9 \\ 0 & 0 & 1 \end{bmatrix}$ and also find the eigen values of $2A^{-1}$.
- Write down the matrix of the quadratic form $2xy + 2yz + 2zx$.
- Test the convergence of the series $6-10+4+6-10+4+6-10+4+.....$
- Discuss the convergence of the series $\frac{1}{\sqrt{1}} - \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} - \frac{1}{\sqrt{4}} +$
- If $x = r \cos \theta$, $y = r \sin \theta$, prove that $J J' = 1$.
- Expand $e^x \cos y$ in powers of x and y upto first degree.
- Evaluate $\int_0^{\infty} x^4 e^{-x} dx$ using gamma function.
- Prove that $\beta(m, n) = \beta(m+1, n) + \beta(m, n+1)$.
- Change the order of integration in the integral $\int_0^a \int_{x^2/a}^{2a-x} (x^2 + y^2) dx dy$
- Evaluate $\int_1^a \int_1^b \frac{dx dy}{xy}$

Part - B (5 x 16 = 80 marks)

- Verify Cayley-hamilton theorem for the matrix $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and hence find A^{-1} and A^4 . (16)
- Test for convergence the series $\frac{1}{2\sqrt{1}} + \frac{x^2}{3\sqrt{2}} + \frac{x^4}{4\sqrt{3}} + \frac{x^6}{5\sqrt{4}} + + \infty$ (8)
 - Test for convergence the series $1 + \frac{2}{5}x + \frac{6}{9}x^2 + \frac{14}{17}x^3 + + \frac{2^n - 2}{2^n + 1}x^{n-1} + (x > 0)$ (8)
 - (OR)
 - State the values of for convergence of the series $\frac{x}{\sqrt{1}} - \frac{x^2}{\sqrt{2}} + \frac{x^3}{\sqrt{3}} - \frac{x^4}{\sqrt{4}} + + \infty$ (8)
 - Test for convergence the series $\frac{1}{2^3} - \frac{1}{3^3}(1+2) + \frac{1}{4^3}(1+2+3) - \frac{1}{5^3}(1+2+3+4) + + \infty$ (8)
- If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 0$ (10)
 - If $u = xy + yz + zx$, where $x = e^t$, $y = e^{-t}$ and $z = \frac{1}{t}$, find $\frac{du}{dt}$. (6)
 - (OR)
 - Examine the function $f(x, y) = x^3 y^2 (12 - x - y)$ (16)
- Prove that $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. (10)
 - Evaluate $I = \int_0^{\pi/2} \sqrt{\cot \theta} d\theta$. (6)
 - (OR)
 - Find the area of the asteroid $x^{2/3} + y^{2/3} = a^{2/3}$, using Gamma Functions. (8)
 - Evaluate $I = \int_0^{\infty} e^{-x^2} dx$ and prove $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$. (8)



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15. a)

(i) Change the order of integration $I = \int_0^a \int_y^a \frac{x}{x^2 + y^2} dx dy$ and then

evaluate.

(8)

(ii) Evaluate $\int_0^{\log 2} \int_0^x \int_0^{x+y} e^{x+y+z} dx dy dz$

(8)

(OR)

b) (i) Evaluate $\iint x y dx dy$ over the positive quadrant of the circle $x^2 + y^2 = 1$.

(8)

(ii) Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{dz dy dx}{\sqrt{1-x^2-y^2-z^2}}$

(8)