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SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.Arch
Title of the Paper: Mathematics – I — Max. Marks: 80
Sub. Code: 621101(2006/07/08/09) — Time: 3 Hours
Date: 06/12/2010 — Session: FN

PART - A (8 X 4 = 32)

Answer ALL the Questions

1. State Cayley – Hamilton theorem for matrices.
2. Find the nature of the quadratic form $2x^2 + 3y^2 + 2z^2 + 2xy$.
3. Evaluate: $\int_1^2 \int_0^x \frac{dxdy}{x^2 + y^2}$
4. Evaluate: $\iint_R dxdy$ over the region bounded by y = 0, x = 0, x+y = 1.
5. Solve $\frac{d^2y}{dt^2} + \frac{dy}{dt} + y = \cosh 2t.$
6. Reduce the differential equation $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} = 0$ into differential equation with constant coefficients.
7. Find the direction cosines of the line joining points (1,-2,3) and (2,-3,4).
8. Find the angle between the line $\frac{x+1}{2} = \frac{y}{3} = \frac{z-3}{6}$ and the plane 3x + y + z = 7.

PART – B (4 x 12 = 48)

Answer All the Questions

9. Verify Cayley Hamilton theorem for A = $\begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$ Hence find A^{-1}.

(or)

10. Reduce the quadratic form $8x^2 + 7y^2 + 3z^2 - 12xy + 4xz - 8yz$ to a canonical form by orthogonal reduction.

11. If $I_n = \int x^n e^{-x} dx, n$ being positive integer, Prove that $I_n = -x^n e^{-x} + n\, l_{n-1}$ Hence show that $\int_0^\infty x^n e^{-x} dx = n!$

(or)

12. Evaluate: $\int_0^{\frac{\pi}{2}} \frac{\sin^2 x}{\sin x + \cos x} dx$

13. Change the order of integration and evaluate: $\int_0^1 \int_{x^2}^{2-x} xy\, dx\, dy$

(or)

14. Evaluate $\iiint \frac{dxdydz}{(x+y+z+1)^3}$ taken over the volume bounded by the planes x = 0, y = 0, z = 0, x + y + z = 1.

15. Solve $(3x+1)^2 \frac{d^2y}{dx^2} + (3x+1)\frac{dy}{dx} + y = 6x.$

(or)

16. Solve by the method of variation of parameters $\frac{d^2y}{dx^2} + y = x \sin x.$