SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act,1956)

Course & Branch :B.Arch - ARCH
Title of the Paper :Mathematics – I — Max. Marks :80
Sub. Code :521101 — Time : 3 Hours
Date :11/05/2010 — Session :FN

PART - A (8 x 4 = 32)

Answer ALL the Questions

1. Express cos 4θ interms of cos θ.

2. If $\tan \frac{x}{2} = \tanh \frac{y}{2}$, prove that cosx coshy = 1.

3. Two eigen values of the matrix $A = \begin{pmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{pmatrix}$ are equatl to 1 each. Find the third eigen value.

4. Determine the nature of $x_1^2 - 2x_1x_2 + x_2^2 + x_3^2$

5. Evaluate $\int_0^{\pi} \int_0^{\sin\theta} r \; dr \; d\theta$

6. Evaluate $\int_0^{\frac{\pi}{2}} \log \tan x \; dx$.

7. Solve $(D4 + 4D^3 + 8D^2 + 8D + 4)\, y = 0$.

8. Find particular integral of the equation f (D) y = sin αx, α a constant.

PART – B (4 x 12 = 48)

Answer All the Questions

9. (a) Expand $\cos^5\theta \sin^7\theta$ in a series of sines of multiples of θ.

(b) Evaluate $\lim_{x \to \infty}$ $(\sin h^{-1} x - \log x)$

(or)

10. (a) If $\cos (A - iB) = \cos \theta + i \sin\theta$, prove that $\cos 2A + \cos h\, 2B = 2$.

(b) If x is small show that $\log \sin x = \log x - \frac{x^2}{6} - \frac{x^4}{180}$ nearly.

11. Diagonalise the matrix $A = \begin{pmatrix} 2 & 2 & -7 \\ 2 & 1 & 2 \\ 0 & 1 & -3 \end{pmatrix}$ by Similarity transformation.

(or)

12. Reduce the quadratic form $x_1^2 + 2x_2^2 + x_3^2 - 2x_1x_2 + 2x_2x_3$ to the canonical form through an orthogonal transformation.

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

(b) If $u_n = \int_0^a x^n e^{-x} dx$ Prove that $u_n - (n+a)u_{n-1} + a(n-1)u_{n-2} = 0.$

(or)

14. (a) Change the order of integration in $\int_0^a \int_{\frac{x^2}{a}}^{2a-x} xy \quad dy \quad dx$ and then evaluate it.

(b) Evaluate $\int_0^{\frac{\pi}{2}} \frac{x}{\sin x + \cos x} dx$.

15. Solve $(x^3 D^3 + 3x^2 D^2 + xD + 1)\, y = \sin(\log x) + \log x$.

(or)

16. (a) Solve $(D^2 + 16)\, x = \cos 3t + t^4$.

(b) Solve $(D^2 + 1)\, y = x \cos x$. by the method of variation of parameters.