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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 :621101 — Time : 3 Hours
Date :25/05/2011 — Session :FN

PART - A (8 x 4 = 32)

Answer ALL the Questions

1. Find the eigen values of $4A^{-1} + 3A + 2I$, if $A = \begin{pmatrix} 1 & 0 \\ 2 & 4 \end{pmatrix}$

2. If the eigen values of $A = \begin{pmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{pmatrix}$ are -3, -3 and 5, find the corresponding eigen vectors.

3. Evaluate: $\int_0^1 \int_0^{\sqrt{1+x^2}} \frac{dydx}{1+x^2+y^2}$

4. Evaluate: $\int_0^{\frac{\pi}{4}} \tan^5 x\,dx$

5. Find the Particular Integral of $\frac{d^2y}{dx^2} + y = \sin 3x \cos 2x.$

6. Solve: $(D^4 + D^2 + 1)y = 0$

7. Find the equation of the plane through the origin and containing the line $\frac{x-1}{5} = \frac{y-2}{4} = \frac{z-3}{5}$.

8. Find the angle between the straight lines whose direction cosines are given by the relations 31 + m + 5n = 0 and 6mn + 2nl + 51n = 0.

PART – B (4 x 12 = 48)

Answer All the Questions

9. Verify Cayley-Hamilton theorem for $A = \begin{pmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{pmatrix}$ and hence evaluate $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 = 5A^3 - 8A^2 + 2A - I$.

(or)

10. Reduce the Quadratic form $6x_1^2 + 3x_2^2 + 3x_3^2 - 4x_1x_2 - 2x_2x_3 + 4x_3x_1$ to canonical form and find the corresponding linear transformation. Also find the index and signature.

11. Change the order of the integration and hence evaluate $\int_0^1 \int_{x^2}^{x} (x^2 + y^2)^{\frac{-1}{2}} dydx$.

(or)

12. Calculate the volume of the solid bounded by the following surfaces: z = 0, $x^2 + y^2 = 1$, x + y + z = 3.

13. Solve: $x^2 \frac{d^2y}{dx^2} - 2x\frac{dy}{dx} - 4y = x^4$ by variation of parameters method.

(or)

14. Solve: $(1+x^2) \frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 4\cos\log(1+x)$

15. Find the length of the shortest distance between the lines $\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}$ *and* $\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}$ and also the equations of the line of shortest distance.

(or)

16. Find the equation to the sphere which passes through the circle $x^2 + y^2 + z^2 - 4x - y + 3z + 12 = 0$, 2x + 3y – 7z = 10 and touch the plane x-2y+2z = 1.