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 :11/05/2010 — Session :FN

PART - A (8 x 4 = 32)

Answer ALL the Questions

1. Find the sum and product of the eigen values of the matrix

$$A = \begin{bmatrix} 1 & 2 & 1 \\ -1 & 2 & 3 \\ 1 & 1 & 4 \end{bmatrix}$$

2. Discuss the nature of the quadratic from
$Q = x^2 + y^2 + 2xy + 2yz$.

3. Find $\int_0^{\frac{\pi}{2}} \sin^5 x \cos^2 x dx$.

4. Shade the region of integration of $\int_{-1}^{0}\int_{-x}^{1} f(x, y)dydx$.

5. Find the particular integral of $(D^2 + 4)\, y - \sin 2x$.

6. If the roots of auxillary equation of a differential equation are 2, 2, 3, 3 write its complementary function.

7. Find the equation to the plane given that (1, -2, 3) in the foot of the perpendicular from the origin to the plane.

8. Find the equation of the sphere concentric with the sphere

$3x^2 + 3y^2 + 3z^2 - 5x + 2y + 7z + 1 = 0$ and passing through the point (1, -1, 2).

PART – B (4 x 12 = 48)

Answer All the Questions

9. (a) Find the eigen values and eigen vectors of the matrix

$$A = \begin{bmatrix} 1 & 2 & -7 \\ 2 & 0 & 2 \\ 0 & 1 & -4 \end{bmatrix}$$

(b) Using cayley Hamiltons theorem find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 3 \\ 1 & 3 & 1 \end{bmatrix}$

(or)

10. Reduce the quadratic form $Q = 2xy + 2yz + 2zx$ into canonical form by orthogonal transformation.

11. (a) Find a reduction formula for $\int \tan^n x dx$

(b) Change the order of integration and evaluate $\int_0^1 \int_{x^2}^{2-x} xdxdy$.

(or)

12. (a) Evaluate $\int_0^{\frac{\pi}{2}} \log \sin x dx$.

(b) Evaluate $\int_0^{\pi} \int_0^{a(1+\cos\theta)} r^2 \sin\theta \, dr \, d\theta.$

13. (a) Solve $(D^2 + D + 1)\, y = \sin 2x$.

(b) Solve by method of variation of parameter $y'' + y = \tan x$.

(or)

14. (a) Solve $x^2y'' - xy' + y = \log x$.

(b) Solve $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 4y = e^{-2x}x^2$.

15. (a) Find the equation of the sphere passing through the circle $x^2 + y^2 + z^2 - 9 = 0,\ 2x + 3y + 4z = 5$ and the point (1, 2, 3).

(b) Find the equation of the plane through the point (1, 0, -2) and perpendicular to the planes $2x + y - z = 2$ and $x - y - z = 3$.

(or)

16. (a) Find the shortest distance between the lines $x + a = 2y = -12z$. and $x = y + 2a = 6z - 6a$.

(b) Find the equation of the sphere that passes through the circle $x^2 + y^2 + z^2 + x - 3y + 2z - 1 = 0,\ 2x + 5y - z + 7 = 0$ and cuts orthogonally the sphere $x^2 + y^2 + z^2 - 3x + 5y - 7z - 6 = 0$.