Question Paper

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
END SEMESTER THEORY EXAMINATION - MAY 2023
II SEMESTER B.Sc (Applied Sciences) in Engg.
Mathematics - II [IMA 121]

Marks: 50   **Duration: 180 mins.**

Answer all the questions.

Missing data, if any, may be suitably assumed

1)

A) Evaluate $\iint xy\,dx\,dy$ where the region is bounded by x-axis, ordinate x=2a and the curve $x^2 = 4ay$. (3)

B) Evaluate $\int_0^{\frac{a}{\sqrt{2}}} \int_{x=y}^{\sqrt{a^2-y^2}} \log_e(x^2 + y^2)dx\,dy$ by changing to polar co-ordinate system. (3)

C) Evaluate $\iiint_S \sqrt{x^2 + y^2}\,dx\,dy\,dz$ where S is the solid bounded by the surfaces $x^2 + y^2 = z^2, z = 0, z = 1$. (4)

2)

A) Find the equation of the smallest sphere which contains the circle $x^2 + y^2 + z^2 + 2x + 6y + 4z - 11 = 0$, $2x + 2y + z + 1 = 0$. (3)

B) Find the equation of the right circular cone generated when the straight line $2y + 3z = 6$, $x = 0$ revolves about z-axis (3)

C) Show that $\int_0^{\frac{\pi}{2}} \frac{d\theta}{\sqrt{\sin\theta}} \, X \, \int_0^{\frac{\pi}{2}} \sqrt{\sin\theta} \, d\theta = \pi$ (4)

3)

A) Find the angle between the surfaces $xy^2z = 3x + z^2$ and $3x^2 - y^2 + 2z = 1$ at the point (1, -2, 1). (3)

B) Verify Green's theorem in the plane for $\oint_c (xy + y^2)dx + x^2dy$ where c is the closed curve of the region bounded by $y = x$ and $y = x^2$. (3)

C) Find all the eigen values and any one corresponding eigen vector of the matrix $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$ (4)

4) (3)

Solve the following using Gauss-Seidel method. Carry out 4 iterations