



Reg. No. :

Name :

Third Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/
Improvement) Examination, November 2022

(2019 Admission Onwards)

COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS

3C03 MAT-PH : Mathematics for Physics – III

Time : 3 Hours

Max. Marks : 40

PART – A

Answer any four questions. Each question carries one mark.

- Evaluate $\int_1^2 \int_0^4 2xy \, dy \, dx$.
- Find a vector parallel to the line of intersection of the planes $3x - 6y - 2z = 15$ and $2x + y - 3z = 5$.
- Let $r(t) = (t^2 + 1)i + (2t - 1)j - 2tk$ be the position of a particle in space at time t . Find particles velocity and acceleration vectors.
- Find the Laplace transform of e^{at} .
- What is the fundamental period of $f(x) = \sin 2\pi x$?

PART – B

Answer any seven questions. Each question carries two marks.

- Find the volume of the prism whose base is the triangle in xy plane bounded by the x – axis and the lines $y = x$ and $x = 1$ and whose top lies in the plane $z = 3 - x - y$.
- Find the average value of $f(x, y) = x \cos xy$ over the rectangle $R : 0 \leq x \leq \pi, 0 \leq y \leq 1$.
- Find the area enclosed by the lemniscate $r^2 = 4\cos 2\theta$.
- Find an equation for the plane through $A(0, 0, 1)$, $B(2, 0, 0)$ and $C(0, 3, 0)$.

P.T.O.



-3-

PART – D

Answer any two questions. Each question carries five marks.

- Evaluate $\int_0^3 \int_0^4 \int_{x=\frac{y}{2}}^{x=\frac{y}{2}+1} \left(\frac{2x-y}{2} + \frac{z}{3} \right) dx dy dz$ by applying the transformation $u = \frac{2x-y}{2}, v = \frac{y}{2}, w = \frac{z}{3}$ and integrating over an appropriate region in uvw -space.
- Find T, N and K for $r(t) = (\cos^3 t)i + (\sin^3 t)j, 0 < t < \frac{\pi}{2}$.
- Using Laplace transform solve $y_1' - 2y_1 + 3y_2 = 0, y_2' - y_1 + 2y_2 = 0, y_1(0) = 1, y_2(0) = 0$.
- Find the two half range expansions of the function

$$f(x) = \begin{cases} \frac{2k}{L}x & \text{if } 0 < x < \frac{L}{2} \\ \frac{2k}{L}(L-x) & \text{if } \frac{L}{2} < x < L \end{cases}$$



-3-

PART – D

Answer any two questions. Each question carries five marks.

- Evaluate $\int_0^3 \int_0^4 \int_{x=\frac{y}{2}}^{x=\frac{y}{2}+1} \left(\frac{2x-y}{2} + \frac{z}{3} \right) dx dy dz$ by applying the transformation $u = \frac{2x-y}{2}, v = \frac{y}{2}, w = \frac{z}{3}$ and integrating over an appropriate region in uvw -space.
- Find T, N and K for $r(t) = (\cos^3 t)i + (\sin^3 t)j, 0 < t < \frac{\pi}{2}$.
- Using Laplace transform solve $y_1' - 2y_1 + 3y_2 = 0, y_2' - y_1 + 2y_2 = 0, y_1(0) = 1, y_2(0) = 0$.
- Find the two half range expansions of the function

$$f(x) = \begin{cases} \frac{2k}{L}x & \text{if } 0 < x < \frac{L}{2} \\ \frac{2k}{L}(L-x) & \text{if } \frac{L}{2} < x < L \end{cases}$$