KATHMANDU UNIVERSITY

2ND INTERNAL TEST

2024

Subject: Math (104) Full marks:20

Time: 1:00 hrs

Attempt all questions.

1(a) find parametric equation of the line through the point (3,2,1) and parallel to x=1+2t, y=2-t, z=3t

(b) find the position, velocity and acceleration of a particle in space of vector valued function

$$\underset{r(t)}{\longrightarrow} = 2Cost \underset{i}{\rightarrow} + 3Sint \underset{j}{\rightarrow} + 4t \underset{k}{\rightarrow} \quad , t = \frac{\pi}{2}$$

(2) (a) Find the unit tangent vector of

$$\underset{r(t)}{\longrightarrow} = (1 + t^3) \underset{i}{\rightarrow} + te^{-t} \underset{j}{\rightarrow} + sin2t \underset{k}{\rightarrow} \quad at\ point\ t = 0$$

(b) Find the bi-normal if space curve

$$\underset{r(t)}{\longrightarrow} = Cost \underset{i}{\rightarrow} + Sint \underset{j}{\rightarrow} + t \underset{k}{\rightarrow}$$

(3) State Green's theorem and verify both form of Green's theorem for the vector field

$$F(x, y) = (x - y) \underset{i}{\rightarrow} + x \underset{j}{\rightarrow} \quad and\ the\ region\ R\ bounded\ by\ unit\ circle\ C:$$

$$\underset{r(t)}{\longrightarrow} = Cost \underset{i}{\rightarrow} + Sint \underset{j}{\rightarrow} \qquad 0 \leq t \leq 2\pi$$

(4) What do you mean by surface integral for flux. Find the flux of

$$F = yz \underset{j}{\rightarrow} + z^2 \underset{k}{\rightarrow} \quad outward\ through\ the\ surface\ S$$

$$cut\ from\ the\ cylinder\ \ y^2 + z^2 = 1\ by\ the\ plane\ x = 0\ and\ x = 1$$

(5) Define Fourier series and find Fourier series expansion of the function

$$\dot{f}(0) = \begin{cases} 0 \ \ if\ -\pi < x < -\frac{\pi}{2} \\ 1 \ \ if\ -\frac{\pi}{2} < x < \frac{\pi}{2} \\ 0 \ \ if\ \frac{\pi}{2} < x < \pi \end{cases}$$