School of Computing Science and Engineering
B.Tech CSE
ETE - Jun 2023

Time : 3 Hours   Marks : 100

Sem IV - C1UC423B - Multivariable Calculus
Your answer should be specific to the question asked
Draw neat labeled diagrams wherever necessary

1. Evaluate: $\int_0^1 \int_0^1 \int_0^1 dz\ dy\ dx$.   K3 CO1 (5)

2. Find the gradient of the scalar field $f(x,y,z) = x^2y^2 + xy^2 - z^2$.   K1 CO1 (5)

3. State Divergence Test for series. Show that the series $\sum_{n=1}^{\infty} \frac{-n}{2n+5}$ is divergent.   K2 CO2 (5)

4. State the Mean value theorem. Check whether it is applicable for the function $f(x) = |x|$ in the   K1 CO2 (10)
    interval $[-1,1]$.

5. Determine the interval and radius of convergence for the power series $\sum_{n=0}^{\infty} \frac{10^n}{n!} x^n$.   K4 CO4 (10)

6) Find all second order partial derivatives of the function $f(x,y) = x^2 \tan(y)$.   K4 CO2 (10)

OR

Write the Taylor series about $x = 0$, for the function $f(x) = \cos(x)$.   K4 CO2 (10)

7. Sketch the region of integration, reverse the order of integration and evaluate the integral   K2 CO3 (10)
    $\int_0^1 \int_y^1 x^2 e^{xy} dx\ dy$.

8. Evaluate $\oint_C (x^2 + y^2)\ dx + (y + 2x)\ dy$ where C is the boundary of the region in the first   K3 CO4 (15)
    quadrant that is bounded by the curves $y^2 = x, x^2 = y$ by Green's theorem.

9. Find the Fourier sine and cosine series of the function $f(x) = k$ in the interval $0 < x < 5$.   K3 CO3 (15)

10) Define curl of a vector field. Find the curl of the vector field $\mathbf{v} = (x^2y^2 - z^3)\,\mathbf{i} + 2xyz\,\mathbf{j} - e^{xyz}\,\mathbf{k}$.   K4 CO4 (15)

OR

Find the area of the region R bounded by $y = x$ and $y = x^2$ in the first quadrant using   K4 CO4 (15)
double integral.