

DEPARTMENT OF CIVIL ENGINEERING
NWFP UNIVERSITY OF ENGINEERING AND TECHNOLOGY PESHAWAR.
All Campuses
Final Term Examination 2nd Semester Spring 2006

Course: Calculus (BSI-102)
Max Marks: 50

Time: 2:15 hours

Note: Attempt all questions

- Q1. a) Find the vector equation of the line tangent to the graph of $r(t) = 4 \cos t \, i - 3t \, j$ at the point $p(2, -\pi)$
- b) Evaluate $\int_0^1 (e^{2t} i + e^{-t} j + tk) dt$
- Q2. a) Sketch the level curve, $z = k$ for specified value of k , $f(x, y) = x^2 + 9y^2$ at $k = 0, 1, 2, 3, 4$
- b) If $w = x^2 y \cos z$, Find $\frac{\partial w}{\partial x}, \frac{\partial w}{\partial y}(2, 1, z)$
- Q3. a) Use total differential to approximate the change in $f(x, y)$ as (x, y) varies from P to Q $f(x, y, z) = 2xy^2z^3$, $P(1, -1, 2)$, $Q(0.99, -1.02, 2.02)$.
- b) At what rate is the volume of a box changing if its length is 8 ft and increasing at 3 ft/s, its width 6 ft and increasing at 2 ft/s and its height is 4 ft and increasing at 1 ft/s?
- Q4. a) Find directional derivative of $f(x, y, z) = \frac{y}{x+z}$ at $P(2, 1, -1)$ in the direction from P to $Q(-1, 2, 0)$.
- b) Find the gradient of $f = \frac{z}{x^2 + y^2}$.
- Q5. a) Locate all relative maxima, relative minima and saddle point, if any $f(x, y) = xy + \frac{a^2}{x} + \frac{b^2}{y}$ ($a \neq 0, b \neq 0$).
- b) At what point or points on the circle $x^2 + y^2 = 1$ does $f(x, y) = xy$ have an absolute maximum and what is that maximum? (Use Lagrange Multiplier)

$$v = w \cdot \nabla f$$

$$\frac{dl}{dt} = 3$$

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