

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End-Term Examination May 2024

B. Tech, Semester-II (Backlog)

Roll No.....

AS1407 : Multivariable Calculus

Time: 2 hours

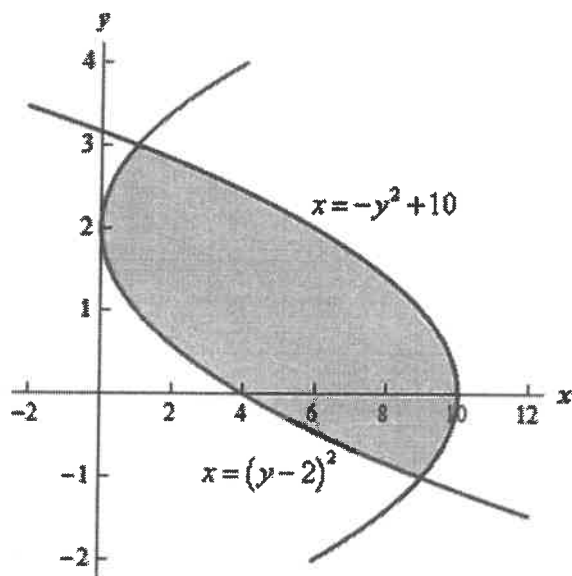
Max. Marks: 40

Instructions to students:

1. Do not write anything other than your roll number on the question paper.

All the Best!!!!

- Q1 Find the total derivative of u w.r.t. t when $u = x^2 - y^2$, $x = e^t \cos t$, and $y = e^t \sin t$ at $t=0$. 3.0
(CO2)
- Q2 If $V = f(2x - 3y, 3y - 4z, 4z - 2x)$, then prove that $6V_x + 4V_y + 3V_z = 0$. 3.0
(CO2)
- Q3 Evaluate by $\int_0^3 \int_1^{\sqrt{4-y}} (x+y) dx dy$ by changing the order of integration. 4.0
(CO3)
- Q4A Compute the surface integral $\iint_{\sigma} 2xz \, dS$, where σ is the first octant portion of the plane
 $z = 3 - x - y$
OR
- Q4B Find the area between the parabola $y=x^2$ and the line $y=x$. 5.0
(CO3)
- Q5 The curve $y = \sqrt{4 - x^2}$, $-1 \leq x \leq 1$, is an arc of the circle $x^2 + y^2 = 4$. Find
• arc length
• area of the surface obtained by rotating this arc about x -axis
• also, find the volume of the resulting solid. 5.0
(CO3)
- Q6 It is required to build a parabolic satellite dish, whose shape will be formed by rotating a parabolic curve $y=ax^2$ about the y -axis. If the dish is to have a diameter of d m and a depth of h m, find the volume of the dish. Here d and h are the parameters. 5.0
(CO1)
- Q7 Determine the area of the region bounded by $x = -y^2 + 10$ and $x = (y-2)^2$. 5.0
(CO3)



Q8

A particle moves along the curve $x = t^3 + 1, y = t^2, z = 2t + 3$ where t is the time. Find the components of velocity and acceleration at $t=1$ in the direction of the vector $\hat{i} + \hat{j} + \hat{k}$

5.0
(CO4)

Q9

Check whether the following vector functions are solenoidal or irrotational -

- $\vec{A} = (x + 3y)\hat{i} + (y - 3z)\hat{j} + (x - 2z)\hat{k}$
- $\vec{B} = (6xy + z^2)\hat{i} + (3x^2y - z)\hat{j} + (3xz^3 - y)\hat{k}$

5.0
(CO4)