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Roll No

MA-110-CBCS

B.E. I & II Semester

Examination, June 2020

Choice Based Credit System (CBCS)

Mathematics - I

Time : Three Hours

Maximum Marks: 60

Note: i) Attempt any five questions.

ii) All questions carry equal marks.

1. a) Write the statement of Lagrange's mean value theorem and verify it for the function $f(x) = x^2 - 4x - 3$ in the interval $[1, 4]$.
b) Find equation of tangent and normal to the curve at a point $(1, 1)$ of the curve $2y = 3 - x^2$
2. a) Discuss the maxima and minima of the function $f(x, y) = x^3 + y^3 - 3xy$
b) Find radius of curvature of the curve $x = a \cos t$; $y = a \sin t$ at a point 't'..
3. Find the radius of curvature at any point of catenary $y = a \cosh \frac{x}{c}$.

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4. If $u = \sec^{-1}\left(\frac{x^3 + y^3}{x + y}\right)$, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 2 \cot 4$.
5. a) Evaluate the following from the definition as the limit of a sum $\int_a^b x^2 dx$.
- b) Evaluate $\int_0^2 x(16 - x^4)^{1/4} dx$.
6. Verify Lagrange's mean value theorem for the function $f(x) = x^2$ in $[-2, 2]$
- OR
- a) Evaluate $\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2) dx dy$
- b) Evaluate $\int_0^3 \int_0^2 \int_0^1 (x + y + z) dx dy dz$
7. State and prove Maclaurin's theorem.
8. a) If $u = e^{xyz}$, find the value of $\frac{\partial^3 u}{\partial x \partial y \partial z}$
- b) Find the tangent line of the curve $y = 2x^3 - 7$ at point $(2, 3)$.
