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Roll No

MA-110**B.E. I & II Semester**

Examination, June 2017

Choice Based Credit System (CBCS)**Mathematics - I****Time : Three Hours****Maximum Marks: 60****Note: i)** Attempt any five out of eight 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) Find the Maclaurin's expansion of $\log(1+x)$
b) Find the radius of curvature at any point 't' of the circle $x = a \cos t$, $y = a \sin t$.
3. a) Discuss the maxima and minima of the function $f(x, y) = x^3 + y^3 - 3xy$ **www.rgpvonline.com**
b) If $u = f(y-z, z-x, x-y)$, then prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$

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4. a) If $u = \log \left(\frac{x^3 + y^3}{x^2 - y^2} \right)$, then find $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$
b) Find the percentage error in the area of an ellipse if 1% error is made in measuring the major and minor axis.
5. a) Using definition of integral as limit of sum, evaluate $\int_a^b e^x dx$
b) Prove that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$
6. a) Evaluate $\lim_{n \rightarrow \infty} \left[\left(1 + \frac{1}{n}\right) \cdot \left(1 + \frac{2}{n}\right) \cdots \left(1 + \frac{n}{n}\right) \right]^{\frac{1}{n}}$
b) Define Beta function and using its definition, evaluate $\int_0^1 x^4 (1-x)^3 dx$ **www.rgpvonline.com**
7. a) Evaluate $\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2) dx dy$
b) Evaluate $\int_0^3 \int_0^2 \int_0^1 (x + y + z) dx dy dz$
8. a) Calculate the volume under the plane $z = 4 - x - y$ over the region $R: 0 \leq x \leq 2, 0 \leq y \leq 1$ in the xy -plane.
b) By changing the order of integration, evaluate $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dx dy$