Code No. 228 / E

FACULTIES OF ARTS AND SCIENCE

B.A. / B.Sc. I-Semester (CBCS) Examination, December 2016

Subject : Mathematics

Paper – I : Differential Calculus

Time : 3 Hours **Max. Marks: 80**

PART – A (5 x 4 = 20 Marks)
(Short Answer Type)

Note : Answer any FIVE of the following questions.

1 Expand f(x) = log (1 + sinx) by using Maclaurin's theorem.

2 Find the c value of Rolle's mean value theorem for the function

$f(x) = \log\left(\dfrac{x^2+ab}{x(a+b)}\right)$ on [a, b].

3 Evaluate $\lim\limits_{x\to 0}(\cot x)^{\sin x}$.

4 Find the radius of curvature of the curve
$x = a\cos^3 t$, $y = b\sin^3 t$ at $t = \pi/4$.

5 If $z = \log(u^2 + v)$, $u = e^{x+y^2}$, $v = x + y^2$ then evaluate $2y\dfrac{\partial z}{\partial x} - \dfrac{\partial z}{\partial y}$

6 If $u = Tan^{-1}\left(\dfrac{y^2}{x}\right)$ then evaluate

$$x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x\partial y} + y^2\frac{\partial^2 u}{\partial y^2}$$

7 Find the asymptotes of the curve $x^2y^2 - x^2y - xy^2 + x + y + 1 = 0$, which are parallel to coordinate axes.

8 Find the envelope of the curve.
$my + m^2x - 10 = 0$ where m is a parameter.

PART – B (4 x 15 = 60 Marks)
(Essay Answer Type)

Note: Answer ALL the questions.

9 (a) (i) $y = a\cos(\log x) + b\sin(\log x)$ then show that
$x^2y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$

(ii) Find the coefficient of x^5 in Maclaurin's series expansion of $f(x)=e^x\cos x$.

OR

(b) (i) State and prove Cauchy's mean value theorem. Hence find 'c' value of Cauchy's mean value theorem for the function $f(x)=e^x$, $g(x) = e^{-x}$ on [a, b].