(b) Find the length of a loop of the curve $r = a(\theta^2 - 1)$

(c) Evaluate $\int_0^{\theta/2} \cos^3\theta \, d\theta$.

(d) Show that $y = x^4$ is concave up ward at the origin.

(e) Find the radius of curvature for $s = \log(\sec\Psi + \tan\Psi)$.

(f) Find the n^{th} derivative of $e^{3x} + e^{-3x}$.

Roll No. .....

91054

B. Sc. (Ist Sem.) Maths (Honours)

Examination – December, 2015

CALCULUS

Paper : BHM-112

Time : Three Hours] *[Maximum Marks : 60*

Before answering the question, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt ***five*** questions in all, selecting ***one*** question from each Section. Question No. 9 is ***compulsory***.

SECTION – I

1. (a) Test for continuity of the function :

$$f(x) = \begin{cases} (x-a)\sin\dfrac{1}{x-a} & \text{when} \quad x \neq a \\ 0 & \text{when} \quad x = a \end{cases}$$

(b) Find the n^{th} derivative of $\dfrac{x^2}{(x-1)^3\,(x+1)}$.

2. (a) State and prove Leibnitz's theorem.

(b) Expand e^{ax} sin bx by Maclaurin's theorem with Lagrange's form of remainder after n terms.

SECTION – II

3. (a) Find all the asymptotes to the curve :

$$(x+y)^2(x+y+2)-x-9y+2=0$$

(b) Find all the asymptotes to the curve $r^n \sin n\theta = a^n$

4. (a) Show that for the curve $y = \log x$, the least value of $|P|$ is $\frac{3\sqrt{3}}{2}$.

(b) Find the points of inflexion on the curve $x = a(2\theta - \sin\theta)$, $y = a(2-\cos\theta)$.

SECTION – III

5. (a) Trace the curve $y(x^2+4a^2)=8a^3$.

(b) Obtain a reduction formula for $\int e^{ax}\cos^n x\,dx$.

6. (a) Find the whole length of the astroid $x^{2/3}+y^{2/3}=a^{2/3}$.

(b) Find the intrinsic equation of the cycloid $x = a(t+\sin t)$, $y = a(1-\cos t)$ and prove that $x^2+p^2=16a^2$.

SECTION – IV

7. (a) Find the area between the curve $y^2=\frac{x^3}{2a-x}$ and its asymptote.

(b) Find the area common to the circle $r = a$ and the cardioid $r = a(1+\cos\theta)$.

8. (a) Find the volume of the torus obtained by rotating the area bounded by the circle $x^2+y^2=a^2$ around the line $x = b\,(b > a)$.

(b) Show that the surface area of the solid of revolution of $r = a(1+\cos\theta)$ about the initial line is $\frac{32}{5}\pi a^2$.

SECTION – V

9. (a) The circle $x^2+y^2=a^2$ is revolved about the x-axis. Find the volume of the sphere so formed.