Copy No. 168926

Roll No. 1787300612

Total No. of Questions : 6] [Total No. of Printed Pages : 4

B.E. IInd Semester (CGPA) Examination, 2017

EF–233

CSE

(Mathematics–I)

Paper : CS-201

Time : 3 Hours] **[Maximum Marks : 60**

Note :– Attempt all questions. Attempt any *two* parts from Question No. 2 to 6. All questions carry equal marks.

1. (a) Find the percentage error in the area of rectangle when an error of the per cent is made in measuring its length and breadth.

(b) Evaluate :

$$\lim_{x\to 0}\left(\frac{\tan x}{x}\right)^{\frac{1}{x^2}}$$

1,168ft above the ground]

(c) If :

$$u = \tan^{-1}\left\{\frac{x^3+y^3}{x-y}\right\}$$

then show that :

$$x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\sin 2u$$

(d) Evaluate the limit of a sum for the series :

$$\lim\left\{\frac{1}{n+1}+\frac{1}{n+2}+\ldots\ldots\ldots+\frac{1}{2n}\right\}$$

(e) Find the length f the arc f the curve $y = \log \sec x$ from $x = 0$ to $x = \pi/3$.

2. (a) Find the Taylor's series expansion of the function about the point $\pi/3$:

$$f(x) = \log \cos x$$

(b) Verify mean value theorem, if $f(x) = x^2 - 4x - 3$ in the interval $[a, b]$, where $a = 1$ and $b = 4$.

(c) Expand $e^{\sin x}$ by Maclaurin's series upto the terms containing x^4.

1,168 ft above the ground!

3. (a) Find the points on the parabola $x = at^2$, $y = 2at$ at which the radius of curvature is equal to its latus rectum.

(b) Find the asymptotes of the curve $x^3y + xy^2 + xy + y^2 + 3x = 0$.

(c) Find the centre of curvature at the point $(1, -1)$ of the curve $y = x^3 - 6x^2 + 3x + 1$. Hence find the equation of the circle of curvature at this point.

4. (a) Prove that $\frac{x}{a} + \frac{y}{b} = 1$ touches the curve $y = be^{-x/a}$ at the point where the curve crosses the axis of y.

(b) If $u = f(r)$ and $x = r\cos\theta$, $y = r\sin\theta$, prove that :

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f''(r) + \frac{1}{r} f'(r)$$

(c) If :

$$u = \tan^{-1}\frac{\sqrt{x^3 + y^3}}{\sqrt{x} + \sqrt{y}}$$

Find the value of :

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

5. (a) Find the limit, when $n \to \infty$ of the product :

$$\left(1+\frac{1}{n}\right)\left(1+\frac{2}{n}\right)^{\frac{1}{2}}\left(1+\frac{3}{n}\right)^{\frac{1}{3}} \ldots\ldots \left(1+\frac{r}{n}\right)^{\frac{1}{r}}$$

(b) Find the summation the value of $\int_0^n x^r dx$.

(c) Evaluate :

$$\int_0^{\pi} \frac{x\tan x}{\sec x\,\mathrm{cosec}\,x}\,dx$$

6. (a) Find the length of the arc of the parabola $y^2 = 4ax$ from the vertex to one extremity of the latus rectum.

(b) Prove that the volume of the real-shaped solid formed by the revolution of the cycloid $x = a(\theta + \sin\theta)$, $y = a(1 - \cos\theta)$ about the tangent at the vertex is $\pi^2 a^3$.

(c) Find the whole area of the curve $a^2x^2 = y^3(2a - y)$.