Assignment-1
CHAPETR-11
Limits, Continuity and Differentiability

EE24BTECH11048-NITHIN.K

C : MCQs with One Correct Answer

1) Let g(x)=$\frac{(x-1)^n}{logcos^m(x-1)}$; $0 < x < 2$, m and n are integers, $m \neq 0$, $n > 0$, and let p be the left hand derivative of $|x-1|$ at $x = 1$. If $\lim_{x\to 1^+} g(x) = p$, then (2008)
   a) $n = 1, m = 1$
   b) $n = 1, m = -1$
   c) $n = 2, m = 2$
   d) $n > 2, m = n$
2) If $\lim_{x\to 0}[1 + xln(1 + b^2)]^{\frac{1}{x}} = 2bsin^2\theta$, $b > 0$ and $\theta \in (-\pi, \pi]$, then the value of θ is (2011)
   a) $\pm\frac{\pi}{4}$
   b) $\pm\frac{\pi}{3}$
   c) $\pm\frac{\pi}{6}$
   d) $\pm\frac{\pi}{2}$
3) If $\lim_{x\to\infty}\left(\frac{x^2+x+1}{x+1} - ax - b\right) = 4$, then (2012)
   a) $a = 1, b = 4$
   b) $a = 1, b = -4$
   c) $a = 2, b = -3$
   d) $a = 2, b = 3$
4) Let $f(x) = \begin{cases} x^2|cos\frac{\pi}{x}| & , x \neq 0 \\ 0 & , x = 0 \end{cases}$, x $\in$ R then f is (2012)
   a) differentiable both at $x = 0$ and at $x = 2$
   b) differentiable at x=0 but not differentiable at x=2
   c) not differentiable at x=0 but differentiable at x=2
   d) differentiable neither at x=0 nor at x=2
5) Let $\alpha(a)$ and $\beta(a)$ be the roots of the equation $(\sqrt[3]{1+a}-1)x^2 + (\sqrt[2]{1+a}-1)x + (\sqrt[6]{1+a}-1) = 0$ where $a > -1$. then $\lim_{a\to 0^+}\alpha(a)$ and $\lim_{a\to 0^+}\beta(a)$ are (2012)
   a) $-\frac{5}{2}$ and 1
   b) $-\frac{1}{2}$ and 1
   c) $-\frac{7}{2}$ and 2
   d) $-\frac{9}{2}$ and 3

D : MCQs with One or More than One Correct

6) If $x + |y| = 2y$, then y as a function of x is (1984-3marks)
   a) defined for all real x
   b) continuous at $x = 0$
   c) differentiable for all x
   d) such that $\frac{dy}{dx} = \frac{1}{3}$ for$x < 0$
7) If $f(x) = x(\sqrt{x} - \sqrt{x+1})$, then- (1985-2marks)
   a) f(x) is continuous but not differentiable at $x = 0$
   b) f(x) is differentiable at $x = 0$
   c) f(x) is not differentiable at $x = 0$

d) none of these

8) The function $f(x) = 1 + |sinx|$ is (1986-2marks)
 a) continuous nowhere
 b) continuous everywhere
 c) differentiable nowhere
 d) not differentiable at $x = 0$
 e) not differentiable at infinite number of points

9) Let [x] denote the greatest integer less than or equal to x. If $f(x) = [xsin\pi x]$, then f(x) is
(1986-2marks)
 a) continuous at $x = 0$
 b) continuous in (-1,0)
 c) differentiable at $x = 1$
 d) differentiable in (-1,1)
 e) none of these

10) The set of all points where the function $f(x) = \frac{x}{(1+|x|)}$ is differentiable, is (1987-2marks)
 a) $(-\infty, \infty)$
 b) $[0, \infty)$
 c) $(-\infty, 0) \bigcup (0, \infty)$
 d) $(0, \infty)$
 e) None

11) The function
$$f(x) = \begin{cases} |x-3|, & \text{x}\geq 1 \\ \frac{x^2}{4} - \frac{3x}{2} + \frac{13}{4}, & x < 1 \end{cases}$$,is
(1988-2marks)
 a) continuous at x=1
 b) differentiable at x=1
 c) continuous at x=3
 d) differentiable at x=3

12) If $f(x)=\frac{1}{2}x - 1$, then on the interval $[0, \pi]$ (1989-2marks)
 a) tan[f(x)] and $\frac{1}{f(x)}$ are both continuous
 b) tan[f(x)] and $\frac{1}{f(x)}$ are both discontinuous
 c) tan[f(x)] and $f^{-1}x$ are both continuous
 d) tan[f(x)] is continuous but $\frac{1}{f(x)}$ is not

13) The value of $\lim_{x\to 0} \frac{\sqrt{\frac{1}{2}(1-cos2x)}}{x}$ (1991-2marks)
 a) 1
 b) -1
 c) 0
 d) none of these

14) The following functions are continuous on (0,π) (1991-2marks)
 a) tanx
 b) $\int_0^x tsin\frac{1}{t}dt$
 c) $\begin{cases} 1, & 0 < x \leq \frac{3\pi}{4} \\ 2sin\frac{2}{9}x, & \frac{3\pi}{4} < x < \pi \end{cases}$
 d) $\begin{cases} xsinx, & 0 < x \leq \frac{\pi}{2} \\ \frac{\pi}{2}sin(\pi + x), & \frac{\pi}{2} < x < \pi \end{cases}$

15) Let $f(x) = \begin{cases} 0, & x < 0 \\ x^2, & x \leq 0 \end{cases}$ then for all x (1994)
 a) $f^|$ is differentiable
 b) f is differentiable
 c) $f^|$ is continuous
 d) f is continuous