

Topics : Fundamentals of Mathematics, Function, Limits

Type of Questions		M.M., Min.
Single choice Objective (no negative marking) Q.1,2,4	(3 marks, 3 min.)	[9, 9]
Subjective Questions (no negative marking) Q.3,5,6,7	(4 marks, 5 min.)	[16, 20]
Match the Following (no negative marking) Q.8	(8 marks, 8 min.)	[8, 8]

1. If  $f(x) = \frac{x-1}{x+1}$ , then  $f(f(ax))$  in terms of  $f(x)$  is equal to

- (A)  $\frac{f(x)-1}{a(f(x)-1)}$       (B)  $\frac{f(x)+1}{a(f(x)-1)}$       (C)  $\frac{f(x)-1}{a(f(x)+1)}$       (D)  $\frac{f(x)+1}{a(f(x)+1)}$

2. If  $f(x) = ((\text{sgn } x)^{\text{sgn } x})^n$ ;  $n$  is an odd integer. Then

- (A)  $f(x)$  is an odd function      (B)  $f(x)$  is an even function  
(C)  $f(x) = 0$       (D) none of these

3. Let  $f(x) = \frac{2}{4^x + 2}$  for real numbers  $x$ . Evaluate :  $f\left(\frac{1}{2011}\right) + f\left(\frac{2}{2011}\right) + \dots + f\left(\frac{2010}{2011}\right)$ .

4. In which of the following functions, range is singleton set.

- (A)  $f(x) = [x] + [-x]$       (B)  $f(x) = \{x\} + \{-x\}$       (C)  $f(x) = |\text{sgn}(x)|$       (D)  $f(x) = \left[\sqrt{x - [x]}\right]$

where  $[x]$ ,  $\{x\}$  and  $\text{sgn}(x)$  are greatest integer function, fractional part function and signum function respectively.

5. Evaluate  $\lim_{x \rightarrow \pi} \frac{1 - \sin \frac{x}{2}}{\cos \frac{x}{2} \left( \cos \frac{x}{4} - \sin \frac{x}{4} \right)}$       (ii)  $\lim_{x \rightarrow 0} \left( \frac{\sqrt{1+x \sin x} - \sqrt{\cos 2x}}{\tan^2(x/2)} \right)$

6. Solve the inequality :  $(2 \log_3^2 x - 3 \log_3 x - 8) (2 \log_3^2 x - 3 \log_3 x - 6) \geq 3$ .

7. Let  $f(x) = \frac{|x^3 - 6x^2 + 11x - 6|}{x^3 - 6x^2 + 11x - 6}$ . Find the set of points 'a' where  $\lim_{x \rightarrow a} f(x)$  does not exist.

8. Column - I

(A)  $\lim_{x \rightarrow 0} [\sin |x| - |x|] =$

(B)  $\lim_{x \rightarrow 0} \left[ \frac{x}{[x]} \right] =$

(C)  $\lim_{x \rightarrow \frac{1}{2}} \left[ x \left[ \frac{1}{x} \right] \right] =$

(D)  $\lim_{x \rightarrow -1} \left[ \frac{[x]}{x} \right] =$

Column - II

(p) 0

(q) 1

(r) Does not exist

(s) -1

( $\therefore$  where  $[ \cdot ]$  denotes greatest integer function)

# Answers Key

1. (C)    2. (A)    3. 1005    4. (D)

5. (i)  $\frac{1}{\sqrt{2}}$     (ii) 6

6.  $\left(0, \frac{1}{\sqrt{27}}\right] \cup \left[\frac{1}{3}, \sqrt{243}\right] \cup [27, \infty)$

7.  $a = 1, 2, 3.$

8. (A)  $\rightarrow$  (s), (B)  $\rightarrow$  (r), (C)  $\rightarrow$  (p), (D)  $\rightarrow$  (q)

