MATHEMATICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 18

Total Marks : 34

Max. Time : 36 min.

Topics : Fundamental of Mathematics, Function, Limits

Type of Questions		**M.M., Min.**
Single choice Objective (no negative marking) Q.1,2,3	**(3 marks, 3 min.)**	**[9, 9]**
Multiple choice objective (no negative marking) Q.4	**(5 marks, 4 min.)**	**[5, 4]**
Subjective Questions (no negative marking) Q.5,6,7	**(4 marks, 5 min.)**	**[12, 15]**
Match the Following (no negative marking) Q.8	**(8 marks, 8 min.)**	**[8, 8]**

1. Total number of positive integers x for which $f(x) = x^3 - 8x^2 + 20x - 13$ is a prime number, is

(A) 1 (B) 2 (C) 3 (D) 4

2. Let f be a real valued function such that for any real x

$f(15 + x) = f(15 - x)$ and $f(30 + x) = -f(30 - x)$

Then which of the following statements is true ?

(A) f is odd and periodic (B) f is odd but not periodic

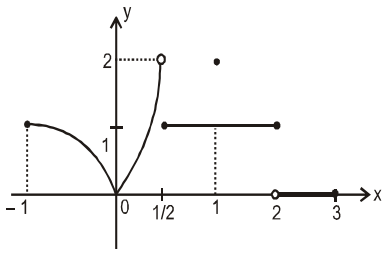
(C) f is even and periodic (D) f is even but not periodic

3. Which of the following functions is **not** periodic, where [.] denotes greatest integer function

(A) $f(x) = 1^{[x]} + (-1)^{[x]}$ (B) $g(x) = 1^{[5x]} + (-1)^{[5x]}$

(C) $h(x) = 2^{[x]} - (-2)^{[x]}$ (D) $\phi(x) = 1^{[x]} - (-1)^{[x]}$

4. Which of the following statements are true for the function f defined for $-1 \le x \le 3$ in the figure shown.



(A) $\lim_{x \to -1^+} f(x) = 1$

(B) $\lim_{x \to 2} f(x)$ does not exist

(C) $\lim_{x \to 1^-} f(x) = 1$

(D) $\lim_{x \to 0^+} f(x) = \lim_{x \to 0^-} f(x)$

(E) $\lim_{x \to c} f(x)$ exists at every c between -1 & 1

(F) $\lim_{x \to c} f(x)$ exists at every c between – 1 & 0.

5. Find the fundamental period of the functions

(i) $f(x) = \sin\left(2\pi x + \frac{\pi}{3}\right) + 2\sin\left(3\pi x + \frac{\pi}{4}\right) + 3\sin 5\pi x$

(ii) $f(x) = \sin\left(\frac{\pi}{3}x\right) + \cos\left(\frac{\pi}{4}x\right)$

6. If $f(x) = 4x^3 - x^2 - 2x + 1$ and $g(x) = \begin{cases} \text{Min}\{f(t) : 0 \le t \le x\} & ; 0 \le x \le 1 \\ 3 - x & ; 1 < x \le 2 \end{cases}$ then find the value of

$g\left(\frac{1}{4}\right) + g\left(\frac{3}{4}\right) + g\left(\frac{5}{4}\right)$.

7. Identify the indeterminate forms (if any) in the following limits :

(i) $\lim\limits_{x\to 0} \frac{\sin x^3}{x^2}$

(ii) $\lim\limits_{x\to 0} \frac{\sin[x^2]}{[x^2]}$; [.] represents the greatest integer function

(iii) $\lim\limits_{x\to 0} |x|^{[\sin^2 x]}$; [.] represents the greatest integer function

(iv) $\lim\limits_{x\to 0^+} \frac{\text{cosec}^{-1} x}{\cot^{-1} x}$

(v) $\lim\limits_{x\to 0^-} \frac{\text{cosec}^{-1} x}{\cot^{-1} x}$

8. Let $f(x) = x + \frac{1}{x}$ and $g(x) = \frac{x+1}{x+2}$.

Match the composite function given in Column–I with respective domains given in Column–II.

Column I		**Column II**	
(A)	fog(x)	(p)	R – {–2, –5/3}
(B)	gof(x)	(q)	R – {–1,0}
(C)	fof(x)	(r)	R – {0}
(D)	gog(x)	(s)	R – {–2, –1}
		(t)	R – {– 1}

Answers Key

1. (C) **2.** (A) **3.** (C) **4.** (A B D)

5. (i) 2 (ii) 24 **6.** 5/2

7. (i) $\frac{0}{0}$ (ii) not defined (iii) non indeterminate

(iv) not defined (v) not defined

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