Name : _____ Date : _____

Time : Start [ ] End [ ] Marks : 120

DPP JEE Main

Class XI & XII | M | 005

MATHEMATICS

Chapter 1 : Sets, Relations and Functions

Topics :

- Complete Chapter

Instructions :

➲ DPP contains 30 questions. ➲ Each DPP contains Multiple Choice Questions (MCQs) and Numerical Value Type Questions. ➲ Each question carries 4 marks. ➲ Mark the correct answer for MCQs and answers to be filled in as a numerical value for Numerical Value Type Questions in the OMR Sheet given at the end of the DPP. ➲ For every incorrect answer deduct 1 mark.

1. The domain of the derivative of the function

$$f(x)=\begin{cases}\sin^{-1}x, & \text{if } |x|\le 1\\ \frac{1}{2}(|x|-1), & \text{if } |x|>1\end{cases} \text{ is}$$

(a) $R-\{0\}$ (b) $R-\{1\}$ (c) $R-\{-1\}$ (d) $R-\{-1, 1\}$

2. Let $\{x\}$ and $[x]$ denote the fractional and integral part of a real number x respectively. Number of solutions of $4\{x\}=x+[x]$ are

(a) 1 (b) 2 (c) 3 (d) Infinite

3. The number of integers in the interval $[-10, 10]$ that will not lie in the domain of $f(x)=\frac{1}{[|x-1|+|5-x|]-4}$ is

(a) 2 (b) 3 (c) 5 (d) None of these

4. The range of $y=\sin^{-1}\left(\frac{x^2+1}{x^2+2}\right)$ is

(a) $\left[\frac{\pi}{6},\frac{\pi}{2}\right)$ (b) $\left[\frac{\pi}{6},\frac{\pi}{2}\right]$ (c) $\left[\frac{\pi}{4},\frac{\pi}{2}\right)$ (d) $\left[\frac{\pi}{4},\frac{\pi}{2}\right]$

5. If $U=\{x: x^5-6x^4+11x^3-6x^2=0\}$ and $A=\{x: x^2-5x+6=0\}$ and $B=\{x: x^2-3x+2=0\}$, then $(A\cap B)'=$

(a) $\{1, 3\}$ (b) $\{1, 2, 3\}$
(c) $\{0, 1, 3\}$ (d) $\{0, 1, 2, 3\}$

6. Even function in the given options is

(a) $2\tan^{-1}(x+\sqrt{1+x^2})-\frac{\pi}{2}$

(b) $\sin^{-1}\left(\frac{\sqrt{1-x}}{2}\right)+\cos^{-1}\left(\frac{\sqrt{1+x}}{2}\right)-\frac{\pi}{2}$

(c) $x\log|\sec x+\tan x|+\sin x\log\left|\frac{1-x}{1+x}\right|$

(d) None of these

7. If $f: [2,\infty)\to[1,\infty)$ is defined by $f(x)=2^{x^4-4x^2}$, then $f^{-1}(x)$ is

(a) $\sqrt{2+\sqrt{4-\log_2 x}}$ (b) $\sqrt{2+\sqrt{4+\log_2 x}}$
(c) $\sqrt{2-\sqrt{4\log_2 x}}$ (d) $\sqrt{2-\sqrt{4+\log_2 x}}$

8. If $g(f(x))=|\sin x|$ and $f(g(x))=\left(\sin\sqrt{x}\right)^2$, then

(a) $f(x)=\sin^2 x, g(x)=\sqrt{x}$
(b) $f(x)=\sin x,\ g(x)=|x|$
(c) $f(x)=x^2, g(x)=\sin\sqrt{x}$
(d) f and g cannot be determined

9. The inverse function of $f(x)=\frac{8^{2x}-8^{-2x}}{8^{2x}+8^{-2x}}$, $x\in(-1,1)$, is _____.

(a) $\frac{1}{4}(\log_8 e)\log_e\left(\frac{1-x}{1+x}\right)$ (b) $\frac{1}{4}(\log_8 e)\log_e\left(\frac{1+x}{1-x}\right)$
(c) $\frac{1}{4}\log_e\left(\frac{1+x}{1-x}\right)$ (d) $\frac{1}{4}\log_e\left(\frac{1-x}{1+x}\right)$

10. Let $f: (-1,1)\to B$ be a function defined by $f(x)=\tan^{-1}\left(\frac{2x}{1-x^2}\right)$, and f is both one-one and onto. Then, B lies in the interval

(a) $\left[0,\frac{\pi}{2}\right)$ (b) $\left(0,\frac{\pi}{2}\right)$ (c) $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$ (d) $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$

11. If $f(x)=\sin x+\cos x$, $g(x)=x^2-1$, then $g(f(x))$ is invertible in the domain

(a) $\left[0,\frac{\pi}{2}\right]$ (b) $\left[-\frac{\pi}{4},\frac{\pi}{4}\right]$ (c) $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$ (d) $[0,\pi]$

12. Let $f: Z\to Z: f(n)=3n$ and let $g: Z\to Z$, defined by

$$g(n)=\begin{cases}\frac{n}{3}, & \text{if } n \text{ is a multiple of 3}\\ 0, & \text{if } n \text{ is not a multiple of 3}\end{cases}.$$

Then,

(a) $gof = I_Z, fog = I_Z$ (b) $gof \neq I_Z, fog \neq I_Z$

(c) $gof = I_Z, fog \neq I_Z$ (d) $gof \neq I_Z, fog = I_Z$

13. Let $f : A \to B$ and $g : B \to A$ such that $(g\,o\,f) = I_A$. Then

(a) f is many one, g is into (b) f is one-one, g is onto

(c) f is many one, g is onto (d) None of these

14. If $f : R \to R$, $g : R \to R$ be two given functions, then $f(x) = 2 \min \{f(x) - g(x), 0\}$ equals

(a) $f(x) + g(x) - |g(x) - f(x)|$ (b) $f(x) + g(x) + |g(x) - f(x)|$

(c) $f(x) - g(x) + |g(x) - f(x)|$ (d) $f(x) - g(x) - |g(x) - f(x)|$

15. Consider a function $f(n)$ defined for all $n \in N$. The function satisfies the following two conditions

(i) $f(1) + f(2) + f(3) + \ldots..$ to $\infty = 1$.

(ii) $f(n) = \{(1 - p)\, p^{-1}\}\{f(n + 1) + f(n + 2) + \ldots..$ to $\infty\}$,

where $0 < p < 1$. Then, $f(2)$ is equal to

(a) $p(1 - p)$ (b) $1 - p$ (c) $1 + p$ (d) none of these

16. Let $f_1(n) = 1 + \frac{1}{2} + \frac{1}{3} + \ldots.. + \frac{1}{n}$, then

$f_1(1) + f_1(2) + f_1(3) + \ldots.. + f_1(n)$ is equal to

(a) $nf_1(n) - 1$ (b) $(n + 1) f_1(n) - n$

(c) $(n + 1) f_1(n) + n$ (d) $nf_1(n) + n$

17. Let $[x]$ denotes the greatest integer less than or equal to x. If the function $f(x) = \tan(\sqrt{[n]}x)$ has period $\frac{\pi}{3}$, then

(a) $n \in (1, 3)$ (b) $n \in (9, 10)$ (c) $n \in [9, 10)$ (d) $n \in (9, \infty)$

18. If $f(x) = \frac{1}{\sqrt{x + 2\sqrt{2x - 4}}} + \frac{1}{\sqrt{x - 2\sqrt{2x - 4}}}$ for $x > 2$, then $f(11) =$

(a) $\frac{7}{6}$ (b) $\frac{5}{6}$ (c) $\frac{6}{7}$ (d) $\frac{5}{7}$

19. Let $f(x) = \frac{x}{(1 + x^n)^{1/n}}$ for $n \geq 2$ and $g(x) = (f\,o\,f\,o\,f \ldots o f)\,(x)$ (where f occurs n times). Then $g(x) =$

(a) $\frac{x}{1 + nx}$ (b) $\frac{x}{(1 + x)^{1/n}}$ (c) $\frac{1}{(1 + nx^n)^{1/n}}$ (d) $\frac{x}{(1 + nx^n)^{1/n}}$

20. If $\log_4\left(\frac{2f(x)}{1 - f(x)}\right) = x$, then $(f(2010) + f(-2009))$ is equal to

(a) 0 (b) –1 (c) 1 (d) 2

Numerical Value Type

21. The difference between the minimum and maximum elements in the range of $y = \frac{1}{\sin^4 x + \cos^4 x}$ is _____ .

22. Sum of maximum & minimum values of $f(x) = \frac{1}{\sin x + 2\cos x + 3}$ is _____ .

23. Let $f(x)$ be a polynomial of degree 3 such that $f(k) = -\frac{2}{k}$ for $k = 2, 3, 4, 5$. Then the value of $52 - 10\,f(10)$ is equal to _____ .

24. Let $S = \{1, 2, 3, 4, 5, 6, 7\}$. Then the number of possible functions $f : S \to S$ such that $f(m \cdot n) = f(m) \cdot f(n)$, for every $m, n \in S$ and $m \cdot n \in S$ is equal to _____ .

25. If $a + \alpha = 1$, $b + \beta = 2$ and $af(x) + \alpha f\left(\frac{1}{x}\right) = bx + \frac{\beta}{x}$, $x \neq 0$, then the value of the expression $\frac{f(x) + f\left(\frac{1}{x}\right)}{x + \frac{1}{x}}$ is _____.

26. Let $A = \{a, b, c\}$ and $B = \{1, 2, 3, 4\}$. Then the number of elements in the set $C = \{f : A \to B \mid 2 \in f(A)$ and f is not one-one$\}$ is _____.

27. The number of elements in range of the relation R given by $R = \{(x, y) : y = x + \frac{6}{x}$; where $x, y \in N$ and $x < 6\}$ is

28. If the period of the function $f(x) = \frac{\sin(\sin(nx))}{\tan\left(\frac{x}{n}\right)}$, $n \in N$, is 6π, then n is equal to_____ .

29. If $f(x) = \log_{e^2 x}\left(\frac{2\ln x + 2}{-x}\right)$ and $g(x) = \{x\}$, where $\{x\}$ denotes the fractional part of x, then value of $[e \cdot g(x)]$, where [ ] = GIF for the existence of $f(g(x))$, is _____ .

30. If $[x]^2 + [x - 2] < 0$ and $\{x\} = \frac{1}{2}$, then the number of possible values of x, is ($[x]$ and $\{x\}$ denote greatest integer less than or equal to x and fractional part of x, respectively) _____ .

OMR SHEET

Use HB pencil only and darken each circle completely.
Mark only one choice for each question as indicated.

Correct marking ● ⓑ ⓒ ⓓ
Wrong marking ⊗ ⓑ ◑ ⊙

1. ⓐ ⓑ ⓒ ⓓ	5. ⓐ ⓑ ⓒ ⓓ	9. ⓐ ⓑ ⓒ ⓓ	13. ⓐ ⓑ ⓒ ⓓ	17. ⓐ ⓑ ⓒ ⓓ	21. _____	25. _____	29. _____
2. ⓐ ⓑ ⓒ ⓓ	6. ⓐ ⓑ ⓒ ⓓ	10. ⓐ ⓑ ⓒ ⓓ	14. ⓐ ⓑ ⓒ ⓓ	18. ⓐ ⓑ ⓒ ⓓ	22. _____	26. _____	30. _____
3. ⓐ ⓑ ⓒ ⓓ	7. ⓐ ⓑ ⓒ ⓓ	11. ⓐ ⓑ ⓒ ⓓ	15. ⓐ ⓑ ⓒ ⓓ	19. ⓐ ⓑ ⓒ ⓓ	23. _____	27. _____	
4. ⓐ ⓑ ⓒ ⓓ	8. ⓐ ⓑ ⓒ ⓓ	12. ⓐ ⓑ ⓒ ⓓ	16. ⓐ ⓑ ⓒ ⓓ	20. ⓐ ⓑ ⓒ ⓓ	24. _____	28. _____	

RESULT M | 005 - MATHEMATICS

Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	

Net Score = (Correct × 4) – (Incorrect × 1) = ...

Percentage Score = ...

Check your learning! If your score is

> 90%	EXCELLENT WORK !
90-75%	GOOD WORK !
74-60%	SATISFACTORY !
< 60%	NOT SATISFACTORY!