# Shiksha Classes Bhandara

**Mathematics** **Topic : Sets, Relations & Functions** **M.M. : 100**

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**Marking Scheme:**

(i) Each question is allotted 4 (four) marks for each correct response.

(ii) ¼ (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

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**Q.1** If A = {5, 6, 7, 8}; B = {3, 9, 8, 10} and S = {1, 2, 3, 4..... 10} then,

(A) $(A \cup B)' = \{1, 2, 3, 4\}$ (B) $(A \cap B)' = \{8\}$

(C) $(A' \cap B)' = (A \cap B)'$ (D) None of these is true

**Q.2** Find period of f (x) = –

(A) $2\pi$ (B) $\pi$

(C) $3\pi$ (D) $4\pi$

**Q.3** Find the correct option among following.

(A) $\{x : x^2 = 3, x \ Q\}$ is a pair set.

(B) $A = \{x : x \ Z \text{ and } x^2 \le 3\}$ and $B = \{x : x \ R \text{ and } x^2 - 3x + 2 = 0\}$ are equal sets.

(C){x : x is people of India speaking Hindi} is an infinite set

(D) The set of prime numbers less than 99 is finite set.

**Q.4** Choose the correct options among the following for any sets A and B.

(1) $P(A) \cup P(B)$ may be equal to P(A)

(2) $P(A) \cup P(B)$ may be equal to $P(A \cup B)$

(3) $P(A) \cup P(B)$ must be a subset of $P(A \cup B)$

(4) $P(A) \cup P(B)$ must be equal to $P(A \cup B)$

(A) 1, 2 are true (B) 1, 2, 3 are true

(C) 1, 3 are true (D) All are correct

**Q.5** Let $A = \{(x, y) : a^x = a^y; a > 0 \text{ and } a \neq 1; a, x, y \ R\}$

$B = \{(x, y) : xy = 1; x, y \ R_o\}$

Choose the correct statements amongst the following.

(A) $A \cap B = B$

(B) $A \cap B = A$

(C) n (B) > n (A)

(D) A and B are non-comparable

**Q.6** Find the domain and range of the function

$$f(x) = \frac{x^2 + x + 1}{x^2 - x + 1}.$$

(A) R, [1/3, 3] (B) R, [1/3, 2]

(C) R, [1/3, 5] (D) R, [1/2, 3]

**Q.7** Choose the correct matching –

| Column (A) | Column (B) |
|---|---|
| (a) $A = \{x : x \text{ is prime}, x \in E\}$ | (i) Finite set but not void set |
| (b) $B = \{(x, y) : y^2 = 4x, x, y \in R\}$ | (ii) Pair set |
| (c) $C = \{(x, y) : y^2 = 4x, x \in I, 0 < x < 5\}$ | (iii) Singleton set |
| (d) D = Set of all Muslim Indian Prime Ministers | (iv) Void set |
| (e) E = Set of all Positive integers less than 3 | (v) Infinite set |

(A) (a)–(ii); (b)–(v); (c)–(iii); (d)–(iv); (e)–(i)

(B) (a)–(iii); (b)–(v); (c)–(i); (d)–(iv); (e)–(ii)

(C) (a)–(iii); (b)–(v); (c)–(i); (d)–(ii); (e)–(iv)

(D) (a)–(ii); (b)–(v); (c)–(i); (d)–(iv); (e)–(iii)

**Q.8** Suppose $A_1, A_2, ...A_{30}$ are thirty sets each with five elements and $B_1, B_2, .....B_n$ are n sets each with three elements such that $\bigcup_{i=1}^{30} A_i = \bigcup_{j=1}^{n} B_j = S$. If each element S belongs to exactly ten of the $B_i$'s and exactly nine of the $B_j$'s, then the value of n is

(A) 15 (B) 135

(C) 45 (D) 90

**Q.9** Choose the correct order of true (T) / false (F) for the following statements –

(1) Every set has at least one proper subset.

(2) If A is a finite, non-void set, having n proper subsets and m subsets then n – m N.

(3) $A = \{\phi, \{\phi\}\}$ then cardinal number of P(A) is 4.

(4) $a \subseteq \{a, \{b\}, \{c\}\}$

(5) 'Set of all squares in a plane' is a subset of 'all rectangles in the same plane'.

(A) TFFFF (B) FFTFT

(C) FFFTT (D) TTTFT

**Q.10** Find the domain of the function f (x), if $f(x) = \sqrt{\log_{0.5} x}$.

(A) $x \in (0, 2]$ (B) $x \in (1, 1]$

(C) $x \in (0, 1]$ (D) $x \in (2, 1]$

**Q.11** If $f(x) = \sqrt{1 + \sin 2x}$ is a periodic function, then find its period.

(A) $2\pi$ (B) $3\pi$

(C) $5\pi$ (D) $\pi$

**Q.12** In a pollution study of 1500 Indian rivers the following data were reported, 520 were polluted by sulphur compounds, 335 were polluted by phosphates, 425 were polluted by crude oil. 100 were polluted by both crude oil and sulphur compounds, 180 were polluted by both sulphur compounds and phosphates, 150 were polluted by both phosphates and crude oil and 28 were polluted by sulphur compounds, phosphates and crude oil. How many of rivers were polluted by atleast one of the three impurties? How many rivers were polluted by exactly one of the three impurties?

(A) 878, 504 (B) 478, 304

(C) 818, 554 (D) (A) 472, 104

**Q.13** Which of the following is an empty set?

(A) $\{x : x \text{ is a real number and } x^2 - 1 = 0\}$

(B) $\{x : x \text{ is a real number and } x^2 + 1 = 0\}$

(C) $\{x : x \text{ is a real number and } x^2 - 9 = 0\}$

(D) $\{x : x \text{ is a real number and } x^2 = x + 2\}$

**Q.14** If A = {2, 4} and B ={3, 4, 5}, then $(A \cap B) \times (A \cup B)$ is
(A) {(2, 2), (3, 4), (4, 2), (5, 4)}
(B) {(2, 3), (4, 3), (4, 5)}
(C) {(2, 4), (3, 4), (4, 4), (4, 5)}
(D) {(4, 2), (4, 3), (4, 4), (4, 5)}

**Q.15** If $A = \{(x, y) : y = e^x; x \in R\}$ $U = \{(x, y) : x, y \in R\}$
$B = \{(x, y) : y = x; x \in R\}$
$C = \{(x, y) : y = -x; x \in R\}$
Choose the correct statement/s among the following :
(A) $(A \cap B)' = \phi$ (B) $(A \cap B \cap C)' = \phi$
(C) $A - B = \phi$ (D) $A \Delta B = A \cup B$

**Q.16** $A = \{(x, y) : y^2 = x, x \in R\}$ and $B = \{(x, y) : y = \sqrt{x}, x \in R\}$.
(1) A = B
(2) $B \subset A$ and $A \subseteq B$
(3) A and B are comparable sets.
(4) A and B both are infinite sets.
Choose the correct option among the following.
(A) 1 , 2 are correct (B) 1 , 3 are correct
(C) 3 , 4 are correct (D) all are correct

**Q.17** Choose the correct matching

| **Column I** | **Column II** |
|---|---|
| (a) A = letters of word 'ball' B = letters of word 'lab' | (i) $P(A) \subset P(B)$ |
| (b) $A \subset B$ | (ii) A and B are incomparable |
| (c) $A = \{x : \cos x > \frac{-1}{2}$ and $0 \le x \le \pi\}$ $B = \{x : \sin x > \frac{1}{2}$ and $\le x \le \pi\}$ | (iii) A = B |
| (d) $A = \{(x, y) : x^2 + y^2 \le 1, x, y \ R\}$ $B = \{(x, y) : 0 \le x \le \frac{1}{2}$ and $y = 0\}$ | (iv) $A \supset B$ |

(A) a – (iii); b – (ii); c – (i); d – (iv)
(B) a – (ii); b – (i); c – (iii); d – (iv)
(C) a – (i); b – (iii); c – (iv); d – (ii)
(D) a – (iii); b – (i); c – (ii); d – (iv)

**Q.18** Which of the following given below is/are a function, from R to R?
(i) $f(x) = x^2$ (ii) $f(x) = \sqrt{x}$ (iii) $f(x) = 3x + 4$.
(A) (i), (ii), (iii) (B) (i), (iii)
(C) (ii), (iii) (D) None of these

**Q.19** Write the equivalent function of the function $f(x) = |x + 2| + |x - 3|$.

(A) $\begin{cases} -2x+1 & ; \ x < -2 \\ 3 & ; \ -2 \le x < 3 \\ 2x-3 & ; \ x \ge 3 \end{cases}$

(B) $\begin{cases} 2x-1 & ; \ x < -2 \\ 5 & ; \ -2 \le x < 1 \\ 2x-1 & ; \ x \ge 3 \end{cases}$

(C) $\begin{cases} -2x+1 & ; \ x < -2 \\ 5 & ; \ -2 \le x < 3 \\ 2x-1 & ; \ x \ge 3 \end{cases}$

(D) $\begin{cases} -2x+1 & ; \ x < -2 \\ 3 & ; \ -2 \le x < 3 \\ 2x+1 & ; \ x \ge 5 \end{cases}$

**Q.20** Find the range of the function, $f(x) = {}^{6-x}C_{x-3}$
(A) {1, 2} (B) {3, 2}
(C) {1, 1} (D) {1, 3}

**For Q.21-Q.25 :**
**The answer to each question is a NUMERICAL VALUE.**

**Q.21** If n (∪) = 80; n(A) = 40; n(B) = 30 and $n(A \cup B)' = 15$ then $n(A \cap B)$ is

**Q.22** The period of $f(x) = \sin 3x + \cos 2x$ is $(A \times \pi)$, then find the value of A.

**Q.23** Let A and B have 3 and 6 elements respectively.
The minimum number of elements in $A \cup B$ is

**Q.24** Find the value of
$$\left[\frac{1}{3}+\frac{1}{100}\right]+\left[\frac{1}{3}+\frac{2}{100}\right]+\left[\frac{1}{3}+\frac{3}{100}\right]+.....\left[\frac{1}{3}+\frac{99}{100}\right]$$
Where [·] denote greatest integer function.

**Q.25** Let $X = \{n \in N : 1 \le n \le 50\}$. If
$A = \{n \in X : n$ is a multiple of 2$\}$ and
$B = \{n \in X : n$ is a multiple of 7$\}$, then the number of elements in the smallest subset of X containing both A and B is_____