

Unit 1: Sets and Functions

Test # 1

Time Allowed: 30 minutes

Total Marks: 20

Section A: Multiple Choice Questions (1 mark each)

1. The set builder form of $\{1, 1/3, 1/5, 1/7, \dots\}$ is:

- (a) $\{x \mid x = 1/n, n \in \mathbb{W}\}$ (b) $\{x \mid x = 1/(2n+1), n \in \mathbb{W}\}$
(c) $\{x \mid x = 1/(n+1), n \in \mathbb{W}\}$ (d) $\{x \mid x = 2n+1, n \in \mathbb{W}\}$

2. If $A = \{\}$, then $P(A)$ is:

- (a) $\{\}$ (b) $\{1\}$ (c) $\{\{\}\}$ (d) \emptyset

3. If A and B are overlapping sets, then $n(A-B)$ equals:

- (a) $n(A)$ (b) $n(B)$ (c) $A \cap B$ (d) $n(A) - n(A \cap B)$

4. If $A = \{1, 2, 3, 4\}$ and $B = \{x, y, z\}$, the Cartesian product $A \times B$ has how many elements?

- (a) 13 (b) 12 (c) 10 (d) 6

5. If $f(x) = x^2 - 3x + 2$, then $f(a+1) = ?$

- (a) $a + 1$ (b) $a^2 + 1$ (c) $a^2 + 2a + 1$ (d) $a^2 - a$

Section B: Short Questions (2 marks each)

1. Define Power Set with an example.

2. Write $\{x \mid x = 2n, n \in \mathbb{N}\}$ in tabular form.

3. Find the power set of $\{0, 1\}$.

4. List all proper subsets of $\{a, b\}$.

5. Let $A = \{1, 2\}$, $B = \{a, b\}$. Find $A \times B$.

Section C: Long Question (5 marks)

1. Verify De Morgan's Laws for $A = \{2, 4, 6, 8, 10\}$, $B = \{1, 3, 5, 7, 9\}$, and $U = \{1, \dots, 10\}$.

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Test # 2

Time Allowed: 30 minutes

Total Marks: 20

Section A: Multiple Choice Questions (1 mark each)

1. If $n(A \cup B) = 50$, $n(A) = 30$ and $n(B) = 35$, then $n(A \cap B) = ?$
(a) 23 (b) 15 (c) 9 (d) 40
2. If $f(x) = 3x + 1$ and $f(x) = 28$, then $x = ?$
(a) 9 (b) 27 (c) 3 (d) 18
3. If $A \subseteq B$ and $B - A \neq \emptyset$, then $n(B - A) = ?$
(a) 0 (b) $n(B)$ (c) $n(A)$ (d) $n(B) - n(A)$
4. Which of the following functions is surjective? $f = \{(1,a), (2,b), (3,b)\}$ on $A = \{1,2,3\}$, $B = \{a,b\}$
(a) injective (b) surjective (c) bijective (d) into only
5. If $A = \{x \mid x \in \mathbb{Q} \wedge x = -x\}$, then tabular form is:
(a) \emptyset (b) $\{0\}$ (c) $\{-1,0,1\}$ (d) $\{x \in \mathbb{R}\}$

Section B: Short Questions (2 marks each)

1. Define Subset with an example.
2. Write $\{x \mid x = 2n+1, n \in \mathbb{N}\}$ in tabular form.
3. Find domain and range of $\{(x,y) \mid y = x\}$ for $A = \{1,2,3\}$.
4. Find $g(-3)$ if $g(x) = 3x + 2$.
5. If $f(3) = 8$ and $f(6) = 14$ for $f(x) = ax + b + 1$, find a and b .

Section C: Long Question (5 marks)

1. Verify distributive law: $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ for $A = \{1,2,3,4\}$, $B = \{3,4,5\}$, $C = \{5,6\}$

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Test # 3

Time Allowed: 30 minutes

Total Marks: 20

Section A: Multiple Choice Questions (1 mark each)

1. If $A=\{2,4,6\}$, $B=\{1,3,5\}$, then $A \cap B = ?$

- (a) \emptyset (b) $\{2,3\}$ (c) $\{1,2\}$ (d) $\{2,4\}$

2. Let $U = \{1,2,\dots,10\}$, $A = \{2,4,6\}$, then $A' = ?$

- (a) $\{2,4,6\}$ (b) $\{1,3,5,7,8,9,10\}$ (c) $\{3,6,9\}$ (d) \emptyset

3. If $f(x)=5x+1$ and $f(x)=31$, then $x=?$

- (a) 6 (b) 5 (c) 7 (d) 10

4. Power set of $\{1,2\}$ contains how many elements?

- (a) 2 (b) 3 (c) 4 (d) 5

5. If $A = \{ \}$, $B = \{0\}$, then $A \cup B = ?$

- (a) $\{ \}$ (b) $\{0\}$ (c) $\{ \{ \} \}$ (d) $\{ \emptyset \}$

Section B: Short Questions (2 marks each)

1. Define Universal Set.
2. Write power set of $\{a, \{b,c\}\}$.
3. List all elements of $A \cup B$, $A = \{2,4,6\}$, $B = \{1,3,5\}$.
4. Find $g(2)$ and $g(-1)$ for $g(x) = ax + b + 5$, given $g(-1)=0$, $g(2)=10$.
5. Write $\{x \mid x = 11n, n \in W, n < 5\}$ in tabular form.

Section C: Long Question (5 marks)

1. Verify associative property of union: $(A \cup B) \cup C = A \cup (B \cup C)$ for $A=\{1,2\}$, $B=\{2,3\}$, $C=\{3,4\}$

Unit 1: Sets and Functions

Test # 4

Time Allowed: 30 minutes

Total Marks: 20

Section A: Multiple Choice Questions (1 mark each)

1. If $A=\{1,2,3\}$, $B=\{x,y\}$, then $n(A \times B)=?$

- (a) 3 (b) 6 (c) 9 (d) 2

2. If $f(x)=x^2+1$, then $h(-1/2) = ?$

- (a) 1 (b) $5/4$ (c) 2 (d) $1/4$

3. If $f(x)=ax+b+1$ and $f(3)=8$, $f(6)=14$, $a=?$

- (a) 1 (b) 2 (c) 3 (d) 4

4. Which of the following is a singleton set?

- (a) $\{1,2\}$ (b) $\{\{a,b\}\}$ (c) $\{a,b\}$ (d) \emptyset

5. Let $A=\{a\}$, then $P(A)=?$

- (a) $\{\emptyset, \{a\}\}$ (b) $\{a\}$ (c) \emptyset (d) $\{\emptyset\}$

Section B: Short Questions (2 marks each)

1. Define singleton set.
2. Find values of $h(x) = x^2 + 1$ for $x = 1, -4$.
3. Find power set of $\{\{a,b\}, \{b,c\}\}$.
4. Write $\{x \mid x \text{ is a divisor of } 100\}$ in set-builder form.
5. Find range of relation $R = \{(x,y) \mid x+y < 5\}$, $x,y \in A = \{1,2,3,4\}$.

Section C: Long Question (5 marks)

1. Prove: $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ using $A=\{1,2,3,4\}$, $B=\{3,4,5\}$, $C=\{5,6\}$

Unit 1: Sets and Functions

Test # 5

Time Allowed: 30 minutes

Total Marks: 20

Section A: Multiple Choice Questions (1 mark each)

1. Which of the following is true for $f=\{(1,a),(2,b),(3,b)\}$:

- (a) Injective (b) Surjective (c) Bijective (d) Into only

2. If $f(x)=3x+1$, then $f(0)=?$

- (a) 1 (b) 0 (c) 3 (d) 2

3. Set of all integers between -100 and 1000 is written in set-builder form as:

- (a) $\{x|x \in \mathbb{N}\}$ (b) $\{x|x \in \mathbb{Z} \wedge -100 < x \leq 1000\}$
(c) $\{x|x \in \mathbb{Q}\}$ (d) $\{x|x > -100\}$

4. What is the number of elements in the power set of $\{1,2,3\}$?

- (a) 6 (b) 9 (c) 8 (d) 7

5. Which is the empty set?

- (a) $\{\emptyset\}$ (b) $\{\}$ (c) \emptyset (d) All of these

Section B: Short Questions (2 marks each)

1. Define Cartesian product.

2. Write two proper subsets of $\{a,b,c\}$.

3. Write tabular form of $\{x \mid x \in \mathbb{P} \wedge x < 12\}$.

4. Verify: $(A-B)' \cap B = B$ for $A = \{2,4\}$, $B = \{2,4,6\}$

5. Find $g(2/3)$ for $g(x) = 3x + 2$.

Section C: Long Question (5 marks)

1. Verify De Morgan's Laws for $U = \{1-20\}$, $A =$ even numbers, $B =$ odd numbers.