AN EDUCATIONAL INSTITUTE

UNIT TEST SERIES XI- Mathematics 2023-24

SUBJECT: MATHEMATICS **MAX. MARKS : 40**
CLASS : XI **DURATION : 90 min**

Unit 1:Sets and Functions
Chapters: Sets,Relations and Functions,Trigonometry

General Instruction:

1. This Question Paper has 5 Sections A-E.
2. **Section A** has 5 MCQs carrying 1 mark each.
3. **Section B** has 3 questions carrying 02 marks each.
4. **Section C** has 5 questions carrying 03 marks each.
5. **Section D** has 1 questions carrying 04 marks each.
6. **Section E** has 2 questions carrying 05 marks each .

Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated

SECTION – A
Questions 1 to 5 carry 1 mark each.

1. If A ={ 0 ,1 ,2 ,3, 4, 5, 6, 7, 8, 9, 10 }, then insert appropriate symbol ∈or ∉in each of the following blank spaces. (i) 4 ... A (ii) − 4 ... A (iii) 12 ... A are
(a) ∈ ,∈, ∈ (b) ∈, ∉, ∈ (c) ∈, ∉, ∉ (d) ∉, ∉ ,∉

2. Two finite sets have m and n elements. The number of subsets of the first set is 56 more than that of the second set. The values of m and n are respectively:

(a) 6,7 (b) 6,4 (c) 6,3 (d)3,6

3. The following set in Roster form is {x : x is positive integer and a divisor of 9}

(a) {1, 3, 9} (b) {1, 3, 8} (c) {9, 8, 27} (d) None of these

4. Let A = {a ,b ,c d, } and B = { x,y ,z }. What is the number of elements in A × B ?

(a) 6 (b) 7 (c) 12 (d) 64

5. The set of all natural numbers x such that $4x + 9 < 50$ in roster form is

(a) {1, 2, 4, 6, 8, 10} (b) {1, 3, 5, 7, 9}
(c) {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} (d) None of the above

SECTION – B
Questions 6 to 8 carry 2 mark each.

6. Express the function f: A—R. $f(x) = x^2 - 1$. where A = { -4, 0, 1, 4) as a set of ordered pairs.

7. If A, B and C are subsets of universal set U where A ={2,4,6,8,12,20}, B ={3,6,9,12,15}, C ={ 5,10 ,15 ,20} and U is the set of all whole numbers, draw a Venn diagram showing the relation of U, A, B and C.

8. If a cosθ + b sinθ = m and a sinθ – b cos θ = n , then show that $a^2 + b^2 = m^2 + n^2$ **.**

SECTION – C
Questions 9 to 13 carry 3 mark each.

9. Show that tan 3x tan 2x tan x = tan 3x – tan 2x – tan x.

10. Find the domain and the range of the real function f(x) = $\sqrt{9 - x^2}$

11. Find $\tan\left(\frac{\pi}{8}\right)$

12. If A, B, and C be sets. Then, show that A∩(B ∪ C) = (A ∩B) ∪ (A∩ C)

13. Use the properties of sets to prove that for all the sets A and B, A – (A ∩ B) = A – B

SECTION – D
Questions 14 carry 4 mark each.

14. Two friends Aman and Bhavna organize Maths quiz in class XI . In quiz each student need to answer the questions prepared by Aman and Bhavna using set A = {x: x < 5 , x ∈ N} and B = {x: x ≤ 2 , x ∈ W} respectively. Based on the above information, answer the following questions:

i)Find (A ∪ B) × (A ∩ B)

ii) Find number of relations from A to B.

iii) Find elements of relation R from set A to B defined by R = {(x, y): x + y = 4, x ∈ A,y ∈ B} and describe the arrow diagram.

Or

Find Domain and Range of relation R from set A to B defined by R= (x, y): $x^2 + y^2$ =16,x∈A,y ∈B}

SECTION – E
Questions 15 to 16 carry 5 mark each.

15. Prove that:

$\cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \cos^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$.

16. Redefine the function
F(x) =| x – 2| + |x + 2| , -3 ≤ x ≤ 3 and draw the graph.

End