SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.
B.Sc.Mathematics - END SEMESTER EXAMINATIONS - NOV'2024
SEMESTER - V
24UMAET5A01 - Mathematical Thinking in Computer Science

Total Duration : 1 Hrs.30 Mins. Total Marks : 40

Section B

Answer any **TEN** questions $(10 \times 2 = 20$ Marks)

1. Find the possibility of tiling a 8 $\times$ 8 chess board without two opposite corners tiled using domino tiling.
2. For any integer $n \geq 0$, show that $5n = 0$.
3. Complete the 4 x 4 magic squares

1	14		
		6	
8	11		
		3	16

4. Imagine we have only 5 and 7 coins. What is the maximum amount that cannot be paid?
5. A simple Tower of Hanoi puzzle consists of 3 pegs and 3 circular disks. What is the least number of moves that are required to move the disks to another empty peg?
6. Prove that for any natural number n : $2 + 2^2 + 2^3 + \ldots + 2^n = 2^{n+1} - 2$.
7. Show that the sum of any five consecutive integers is divisible by 5.
8. What is the maximum number of rooks that can be placed on an 8x8 chessboard without any two attacking each other?
9. What is the maximum number of two-digit integers that can be selected under the given constraint if the constraint is that no two selected integers share the same tens digit?
10. There are boys and girls in a class. Some of them study French, while others study German. Prove that there are a boy and a girl studying different languages.

Contd...

11. For which of these statements is one example enough to prove them? For which of them is one counterexample enough to disprove them?
    1. All crocodiles are green.
    2. White lions exist.
    3. No tiger is green.
    4. Some cats are white.
12. In a group of 27 students every girl knows four boys and every boy knows five girls. Find the number of boys in the group.

Section C

Answer any **FOUR** questions $(4 \times 5 = 20$ Marks)

13. Prove $1^2 + 2^2 + 3^2 + 4^2 + ... + n^2 = \frac{n(n+1)(2n+1)}{6}$.
14. Prove that if the sequence $\{a_n\}n = 1\ to\ \infty$ tends to limit L as $n \to \infty$, then for any fixed number $M > 0$, the sequence $\{Ma_n\}\ n = 1\ to\ \infty$ tends to the limit ML.
15. Prove that for any integer n, atleast one of the integers n, $n+2$, $n+4$ is divisible by 3.
16. Prove that every odd natural number is of one of the forms $4n + 1$ or $4n + 3$ where n is an integer.
17. Fill a 3×5 table with integers so that the sum of each row is equal to 20 and the sum of each column is equal to 10.
18. In a group of 20 students everyone has solved three problems from the homework assignment, and each problem was solved by two students. What is the number of problems in the assignment?

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