B.Tech/M.Tech(Integrated) DEGREE EXAMINATION, DECEMBER 2023

Fifth Semester

21MAB302T - DISCRETE MATHEMATICS

(For the candidates admitted during the academic year 2022-2023 onwards)

Note:

   i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

   ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours   **Max. Marks: 75**

PART - A (20 × 1 = 20 Marks)
Answer all Questions

		Marks	BL	CO

1. If A={2,4,6} then nof subsets of A is   1   1   1
   (A) 2^3 (B) $2^6 - 1$
   (C) 2^5 (D) $2^5 - 1$

2. Let A={1,2,3,4,5,6,7,8,9,10}. Then n of subsets of A containing exactly three elements is   1   2   1
   (A) 150   (B) 250
   (C) 120   (D) 45

3. The relation R in the set Z on integers given by R={(a,b) : a-b is divible by 3} is   1   2   1
   (A) Reflexive only   (B) Reflexive but not symmetric
   (C) symmetric and Transitive only   (D) Equivalence relation

4. If f is a function from A to B and n(A)=2, n(B)=4, then of functions is   1   3   1
   (A) 35   (B) 53
   (C) 8   (D) 16

5. If $n(A) = 24, n(B) = 15$ and $n(A \cap B) = 3$, then $n(A \cup B)$ is   1   2   2
   (A) 34   (B) 36
   (C) 31   (D) 30

6. Number of different 2-digit numbers can be made from digits 0,1,2,3,4,5,6,7,8,9 is   1   1   2
   (A) 99   (B) 101
   (C) 100   (D) 95

7. Number of permutations of the letters A, B, C, D, E, F ,G containing the string BCD is   1   3   2
   (A) 140   (B) 120
   (C) 110   (D) 100

8. In a course, a professor gives five grades $\{A, B, C, D, F\}$. What is the minimum number of students required so that four of them are guaranteed to get the same grade   1   3   2
   (A) 18   (B) 14
   (C) 16   (D) 26

9. $p \vee p=$ 1   3   3
   (A) p   (B) q
   (C) T   (D) F

10. $p \vee T=$ 1   3   3
    (A) T   (B) F
    (C) p   (D) $\neg p$

11. $p \vee (q \wedge r) =$ 1   3   3
    (A) $(p \wedge q) \vee (p \wedge r)$ (B) $(p \vee q) \wedge (p \vee r)$
    (C) T   (D) F

12. "If Rama works hard, he will get success"   1   4   3
    where p-Rama works hard, q-he will get success.
    Then the logical statement of the above statement is
    (A) $p \wedge q$ (B) $p \to q$
    (C) $p \vee \neg q$ (D) $p \wedge \neg q$

13. Let $G = \{1, -1, i, -i\}$ be a group under addition.   1   3   4
    Then the inverse of -i is
    (A) i   (B) -i
    (C) 1   (D) -1

14. In a group $(G, *)$, if $a * a^{-1} = a^{-1} * a = e$, where e is the identity element, a^{-1} is   1   2   4
    called
    (A) identity element   (B) idempotent element
    (C) additive element   (D) inverse element

15. If $(z, +)$ is an abelian group where $Z = \{\pm 1, \pm 2, \pm 3, \ldots \ldots\}$, then the inverse of   1   4   4
    $a \in Z$ is
    (A) 2a   (B) 3a
    (C) -a   (D) a

16. A group $(G, *)$ is said to be commutative if   1   2   4
    (A) $a * e = e * a = a$ (B) $a * b = b * a$
    (C) a*b=0   (D) a*b=1

17. If the origin and terminus of a walk are same, the the walk is known as   1   3   5
    (A) open   (B) closed
    (C) path   (D) semi open

18. A graph with no edges is known as empty graph. Empty graph is also known as   1   3   5
    (A) Trivial graph   (B) regular graph
    (C) Bipartite graph   (D) closed graph

19. A graph with no circuits is called   1   2   5
    (A) closed graph   (B) open graph
    (C) Tree   (D) closed path

20. For a graph with n vertices and e edges, $\sum_{v_i} deg v$ 1   4   5
    (A) 2e   (B) 4e
    (C) 5e   (D) e

PART - B (4 × 10 = 40 Marks)
Answer **any 4** Questions

                                                    Marks   BL   CO

21. If Z → N is defined by   10   3   1
    f(x) = 2x–1 if x > 0
    f(x) = –2x, if x $\leq$ 0
    (a)   Prove that the function is 1-1 and onto
    (b)   Determine f^{-1}

22. Find the integers m and n such that $512m + 320n = 64$ and state   10   3   2
    Euclid algorithm.

23. Let G be a set of permutations defined on $\{1, 2, 3\}$.   10   3   4
    Then prove that G is a group under composition.

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24. Show that $t \wedge s$ can be derived from the following statements $p \to q, q \to \neg r, r,$ 10   1   3
$p \vee (t \wedge s)$

25. State and prove the necessary and sufficient condition for a subset to be a subgroup   10   4   4
of a group

26. (a)State and prove and shaking theorem and also verify the theorem for the following   10   3   5
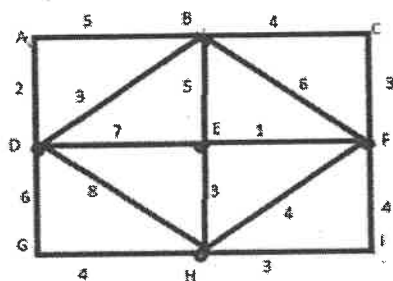graph
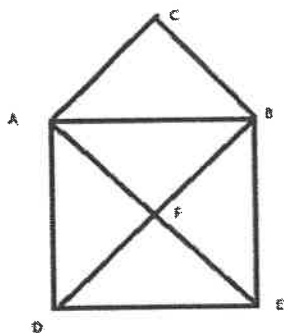
(b) Define Eulerian graph and give one example

PART - C (1 × 15 = 15 Marks)
Answer **any 1** Questions

27. Find the minimum spanning tree for the following weighted graph using Kruskal's   15   3   5
algorithm

28. Show that the following set of statements is inconsistent   15   3   3
If Rama gets his degree, he will go for a job.
If he goes for a job, he will get married.
If he goes for higher studies, he will not get married.
Rama gets his degree and goes for higher study.

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