

28. a. Prove that the premises $p \rightarrow q, q \rightarrow r, s \rightarrow \neg r$ and $p \wedge s$ are inconsistent. 10 3 3 1

(OR)

b. Using mathematical induction, prove that $1^2 + 3^2 + 5^2 + \dots + (2n-1)^2 = \frac{1}{3}n(2n-1)(2n+1)$. 10 3 3 1

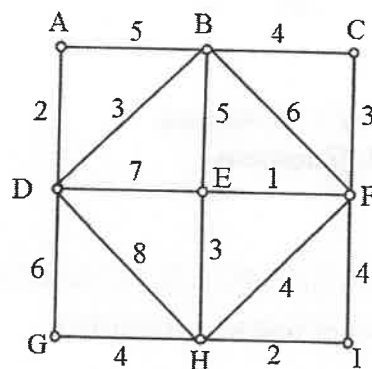
29. a. Define cyclic group and subgroup. Prove that every subgroup of a cyclic group is also cyclic. 10 3 4 1

(OR)

b. Define generator matrix. Find the code words generated by the encoding function $e: B^3 \rightarrow B^6$ with respect to the parity check matrix.

$$H = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

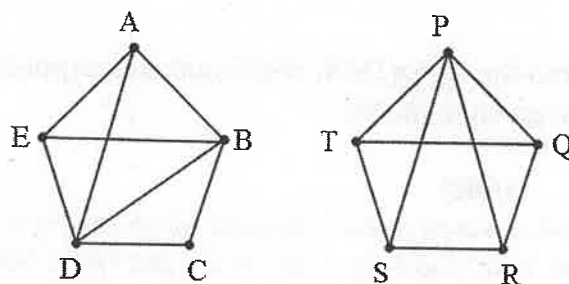
30. a. Using Kruskal's algorithm, determine a minimum spanning tree for the weighted graph given below: 10 4 5 2



(OR)

b.i. Prove that the number of odd degree vertices in an undirected graph is always even. 5 4 5 2

ii. Determine whether the following two graphs are isomorphic. Justify with valid reasons. 5 4 5 2



Reg. No.

B.Tech. DEGREE EXAMINATION, NOVEMBER 2022

Sixth and Seventh Semester

18MAB302T – DISCRETE MATHEMATICS FOR ENGINEERS

(For the candidates admitted from the academic year 2018-2019 to 2019-2020)

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 should be answered in answer booklet.

Time: 2½ Hours

Max. Marks: 75

PART – A (25 × 1 = 25 Marks)

Answer ALL Questions

- | Questions | Marks | BL | CO | PO |
|--|-------|----|----|----|
| 1. Given sets A and B, the set A-B will have elements belonging to _____
(A) Both A and B (B) Only A and not in B
(C) Only B and not in A (D) Neither in A nor in B | 1 | 1 | 1 | 1 |
| 2. If the set A has 3 elements, then its power set P(A) will have _____ elements.
(A) 3 (B) 6
(C) 8 (D) 9 | 1 | 2 | 1 | 2 |
| 3. Composition of functions is _____
(A) Associative (B) Commutative
(C) Reflexive (D) Anti-reflexive | 1 | 1 | 1 | 1 |
| 4. Warshall algorithm is used to evaluate the _____ of a matrix relation.
(A) Reflexive closure (B) Symmetric closure
(C) Anti-symmetric closure (D) Transitive closure | 1 | 2 | 1 | 2 |
| 5. If A and B are disjoint sets, then $ A \cup B = ______$, where A denote the cardinality of A.
(A) $ A + B $ (B) $ A \cdot B $
(C) $ A - B $ (D) $ B - A $ | 1 | 1 | 1 | 1 |
| 6. If n pigeonholes are occupied by n+1 pigeons, then atleast _____ pigeonhole(s) will have more than one pigeons.
(A) One (B) Two
(C) n/2 (D) n+1/2 | 1 | 2 | 2 | 2 |
| 7. Number of ways in which r persons can be seated round a table is _____
(A) r! (B) (r-1)!
(C) (r+1)! (D) $\left(\frac{r}{2}\right)!$ | 1 | 1 | 2 | 1 |
| 8. Choose n such that \sqrt{n} is rational.
(A) 2 (B) 3
(C) 4 (D) 5 | 1 | 1 | 2 | 1 |

9. If p is a prime number such that p divides a^2 , then
 (A) a will divide p (B) p will divide a
 (C) p will divide $a^2 + p + 1$ (D) p will divide $(a + p)^2 + 1$
10. If a divides b and b divides c , which among the following is true?
 (A) a divides $b+c$ (B) a divides $bc+ca+1$
 (C) $a=b$ (D) a divides c
11. $p \rightarrow q$ is logically equivalent to _____
 (A) $\neg p \vee \neg q$ (B) $\neg p \wedge \neg q$
 (C) $\neg p \vee q$ (D) $\neg p \wedge q$
12. The contrapositive of $q \rightarrow p$ is _____
 (A) $p \rightarrow q$ (B) $\neg p \rightarrow \neg q$
 (C) $p \rightarrow p$ (D) $\neg q \rightarrow \neg p$
13. In the proposition $p \rightarrow q$, the proposition p is called as
 (A) Premise (B) Conclusion
 (C) Consequence (D) Tautology
14. A proposition that is neither a tautology nor a contradiction is called a
 (A) Hypothesis (B) Contingency
 (C) Premise (D) Conclusion
15. $p \vee \neg p \equiv$ _____
 (A) p (B) $\neg p$
 (C) T (D) F
16. A group of 10 elements will have _____ identity element(s) in it.
 (A) 1 (B) 2
 (C) 5 (D) 10
17. A group which is commutative is called as _____
 (A) Bijective (B) Permutative
 (C) Abelian (D) Translation
18. The generators of the group $G = \{1, -1, i, -i\}$ under multiplication are
 (A) $\{1, -1\}$ (B) $\{1, i\}$
 (C) $\{i, -i\}$ (D) $\{-1, -i\}$
19. The distance between $x = 110110$ and $y = 000101$ is _____
 (A) 2 (B) 4
 (C) 6 (D) 0
20. If the minimum distance between two code words is 3, then the number of errors can be detected is _____
 (A) 5 (B) 4
 (C) 3 (D) 2

21. If every vertex has the same degree in a graph, then the graph is called
 (A) Tree (B) Regular graph
 (C) Path (D) Eulerian
22. The number of odd degree vertices in an undirected graph is _____
 (A) Odd (B) Even
 (C) One (D) Zero
23. A graph has n vertices and m edges. Then the order of the adjacency matrix will be _____
 (A) $m \times m$ (B) $n \times n$
 (C) $m \times n$ (D) $n \times m$
24. Let T be a tree with 10 edges in it. Then T will have _____ vertices.
 (A) 10 (B) 9
 (C) 11 (D) 100
25. Let G be a graph with 5 vertices and 7 edges. Then the spanning tree T of G will have _____ vertices in it.
 (A) 5 (B) 7
 (C) 12 (D) 35

PART – B (5 × 10 = 50 Marks)
 Answer ALL Questions

26. a. Let
 $A = \{1, 2, 3, 4, 5\}$ and $R = \{(1, 1), (1, 5), (2, 3), (2, 4), (1, 3), (3, 3), (4, 2), (4, 4), (5, 4)\}$.
 Find the transitive closure of R using Warshall's algorithm.
- (OR)
- b.i Determine whether the function $f: \mathbb{Z}^+ \rightarrow \mathbb{Z}^+$ defined by $x^2 + 2$ is injective or/and surjective.
- ii. Define inverse of a function f . Prove that if the inverse of f exists, then it is unique.
27. a. Using Euclidean algorithm find the GCD(1819, 3587) and also express GCD as a linear combination of the given numbers.
- (OR)
- A man hiked for 10 hours and covered a total distance of 45 km. It is known that he hiked 6 km in the first hour and only 3 km in the last hour. Show that he must have hiked at least 9 km within a certain period of 2 consecutive hours.
- ii. How many binary strings of length 8 either start with a "1" bit or end with two bits "00"?