PARUL UNIVERSITY
Faculty of Engineering and Technology
B. Tech. Programme (3rd Semester) (CSE/ IT)
Discrete Mathematics (303191202)
Academic Year 2024-25

Question Bank-1

1. Check if the relation $R = \{(1,2), (2,3), (7,4), (1,5), (9,3)\}$ defined on a set $A = \{0,1,2,7,9\}$ to set $B = \{1,2,3,4,5\}$ is a function or not? Justify your answer with appropriate reason.
2. Check whether the compound preposition $(p \vee q) \wedge \sim p \wedge \sim q$ is satisfiable or not satisfiable by using truth table.
3. Let R be the relation on the set of real numbers such that $a\ R\ b$ if and only if $a - b$ is an integer. Is R an equivalence relation?
4. For the graph shown in Figure-a**,** answer the following questions:
   a. Total number of vertices in the graph.
   b. Total number of edges in the graph.
   c. Verify Hand -shaking Theorem.

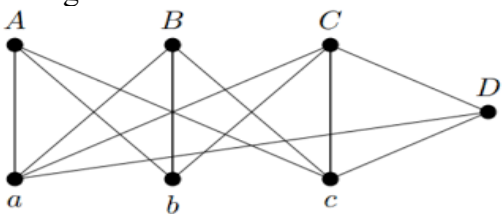


Figure-a

5. Find the zero-one matrix of the transitive closure of the relation R where the corresponding matrix is given by, $M_R = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$.
6. Check whether the Hasse diagram shown in the figure-b is a Lattice or not. Justify your answer with appropriate reason.

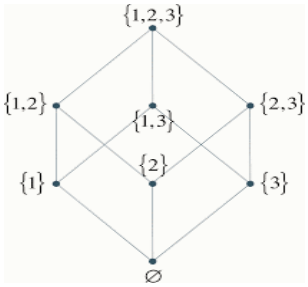
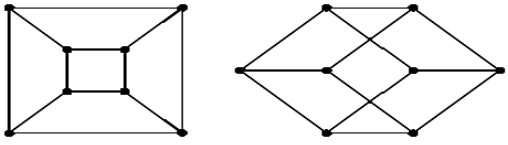


Figure-b

7. Define a Pseudo-graph, a Complete graph, a n-regular graph.
8. Determine whether the following graphs G and H as shown in figure-c are isomorphic or not? Justify your answer with appropriate reasons.



G **H**

Figure-c

9. For all $n \geq 1$, prove by using Mathematical Induction,
$1.2.3 + 2.3.4 + 3.4.5 + \cdots + n(n+1)(n+2) = \frac{\{n(n+1)(n+2)(n+3)\}}{4}$
10. Find the incidence and adjacent matrices of the graph shown in figure-d

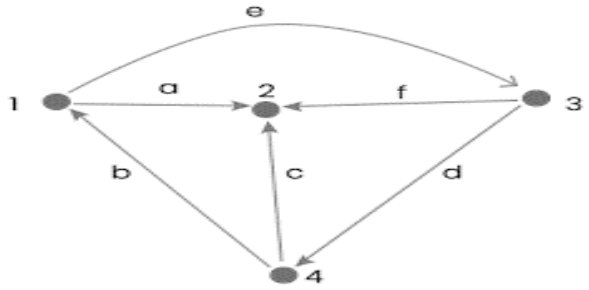


Figure-d

11. Find the $gcd(270,192)$ by Euclidian Algorithm.
12. How many numbers of four digits can be formed with the digits 0, 5, 7, 8 and 9 without repeating of digits?
13. Check whether the graph shown in figure-e is a bipartite graph or not? Justify your answer with giving an appropriate reason.

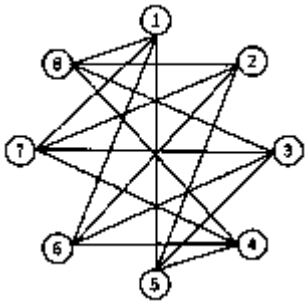


Figure-e

14. Write the converse, inverse, and contrapositive of the statement "If I am reading, then I am scoring good marks."
15. Consider the poset for the Hasse diagam shown in figure-f. Find the following:
    a. Find the maximal elements.
    b. Find the minimal elements.
    c. Is there a greatest element? If yes, specify it.
    d. Is there a least element? If yes, specify it.

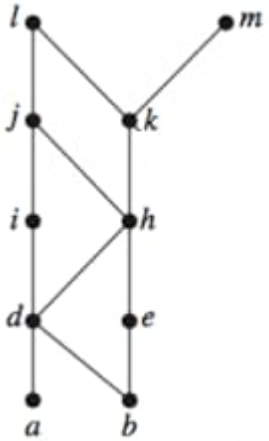


Figure – f

16. Prove that $\sqrt{2}$ is irrational by giving a proof by contradiction.

17. Check whether the graph shown in figure-g contains a Euler path and a Hamiltonian path or not?

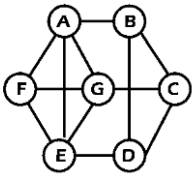


Figure-g

18. If n (A) = p and n (B) = q, then what are the total number of relations and n ($A \times B$)?
19. Write the negation of the statement, "All sides of a square are same in length."
20. What is a Hasse Diagram? State the steps to follow to construct a Hasse Diagram.
21. What is the difference between walk and path.
22. By using truth table prove that $(p \wedge \neg q) \vee (q \wedge \neg p)$ is logically equivalent to $(p \leftrightarrow \neg q)$.
23. Which rules of inference is applied in the statement "If p is true therefore, $p \vee q$ is also true."
24. How many vertices are there in W_6 graph?
25. State Pigeon hole principle.