PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B. Tech. Summer 2021 - 22 Examination

Semester : 3   **Date: 25/04/2022**
Subject Code: 203191202/ 03191202   **Time: 2:00pm to 4:30pm**
Subject Name: Discrete Mathematics   **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 **Objective Type Questions** - (All are compulsory) (Each of one mark)   **(15)**
1. In directed graph if there are never two edges in opposite directions between distinct vertices then relation is
   A) Symmetric   B) Anti-Symmetric
   C) Reflexive   D) Transitive
2. What is the remainder when - 17 is divided by 5?
   A) 3   B) -3
   C) 2   D) -2
3. If U= {1, 2, 3, 4, 5, 6} A= {1, 2, 3, 4} B={3, 4, 5, 6} using bit string find the intersection of the sets A and B.
   A) 11 11 00   B) 00 11 11
   C) 11 11 11   D) 00 11 00
4. What is the identity element in Z under the operation given as a∗b=a+b−7,for any a , b∈Z.
   A) -7   B) 14
   C) 7   D) None of these
5. Consider Z_{10} under addition modulo 10. If $2 \in Z_{10}$ then the order of 2 is
   A) 2   B) 5
   C) 1   D) 3
6. . $P(n,n)$ ... ...
7. The degree of isolated vertex is -------------
8. A compound proposition that always takes the final truth value as true is called ………..
9. (1 4 5 6)(3 7 2 9 8) is _____ permutation (Even/Odd)
10. What is the Cardinality of the Power set of the set {0, 1, 2}?
11. Spanning tree of the simple graph is unique(True/False)
12. How many edges are there in a graph with 10 vertices of degree 8 each ?
13. If the left coset and right coset are same then the group is called cyclic (True/False)
14. How many different bit strings of length eight are there?
15. Product of two irrational is _____.

Q.2 Answer the following questions. (Attempt any three)   **(15)**
A) Determine whether each of the compound propositions is satisfiable.
$$(p \lor \neg q) \land (q \lor \neg r) \land (r \lor \neg p)$$

B) Show that (G ,+₅) is a cyclic group, where G={ 0, 1, 2, 3, 4 }.
C) Prove using Principle of mathematical induction,

$$1^2 + 2^2 + 3^2 + \ldots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

E) Check if the set of all non-negative integers is an abelian group under usual addition of integers.

Q.3 A)

1. Construct a truth table for each of these compound propositions **(03)**
$(p \rightarrow q) \rightarrow (q \rightarrow p)$

2. Show that $\neg(p \lor (\neg p \land q))$ and $\neg p \land \neg q$ are logically equivalent ,without using **(04)** truth table.
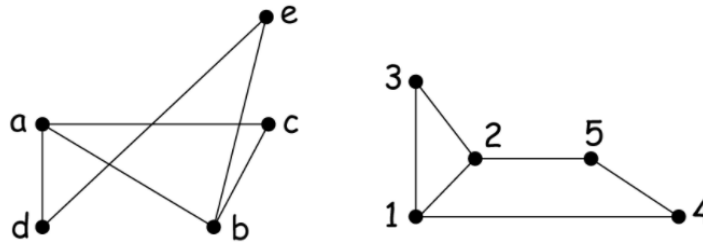
B)

1. Find the zero–one matrix of the transitive closure of the relation R where **(04)**

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

2. Show that if n is an integer and $n^3 + 5$ is odd, then n is even using a proof by **(04)** contraposition and Contradiction.

OR

B)

1. Determine whether the given pair of graphs is isomorphic? **(04)**

2. What are the negations of the statements $\forall x(x^2 > x)$ and $\exists x(x^2 = 2)$? **(04)**

Q.4 A)

1. Find the bitwise OR, bitwise And & bitwise XOR of each of the following **(04)** pairs of bit strings:
(a) 1111 0000, 1010 1010
(b) 00 0111 0001, 10 0100 1000

2. Solve the equation for x under S_6: **(03)**
$$(1 \quad 4 \quad 2 \quad 5)^3 \, x = (2 \quad 3 \quad 5 \quad 4)^{-1}$$
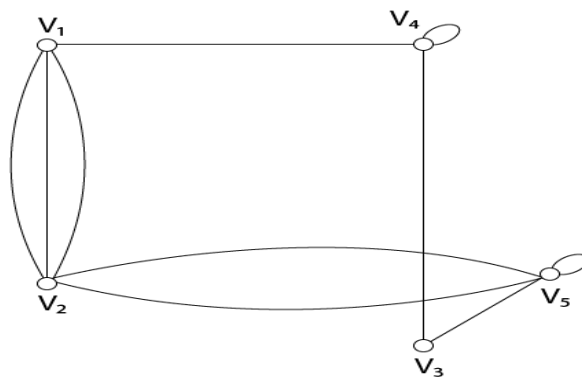
OR

A) Use Prim's and Kruskal's algorithm for finding the minimum spanning tree from **(07)** the following weighted graphs ?
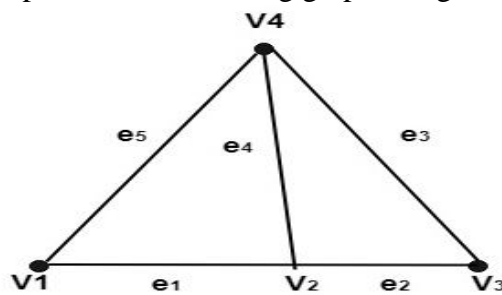
B)

1) A) Represent the following graph using adjacency matrix. **(04)**

B) Represent the following graph using incidence matrix.

2) A) Define Complete Bipartite Graphs also draw $K_{2,3}$, $K_{3,3}$ and $K_{3,5}$ **(04)**

B) Give the statement of THE HANDSHAKING THEOREM and use it ,to find the number of vertices If simple graph G has 24 edges and degree of each vertex is 4.