Seat No:_____ **Enrollment No:_____**

PARUL UNIVERSITY

FACULTY OF IT & COMPUTER SCIENCE

MCA Winter 2017 – 18 Examination

Semester: 1 **Date: 03/01/2018**
Subject Code: 05291101 **Time:02:00pm to 04:30pm**
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 Answer the following

A. Fill in the blanks **(05)**

1. If a relation *R* satisfies reflexive, anti- symmetric and Transitive property then the relation is called _____ relation
2. If the truth value of $p \vee q$ is F then the truth value of $\neg p \wedge \neg q$ is _____.
3. A vertex with degree one is called _____ vertex.
4. The adjacency matrix of a simple graph is a _____matrix.
5. The join irreducible elements of a lattice L, which immediately succeed 0 are _____.

B. Multiple choice type questions & true or false **(10)**

1. If a group satisfies commutative property then it is known as

(a) abelian Group (b)symmetric group (c)semigroup (d)monoid

2. A semigroup $(G, *)$ is said to be monoid if

(a) $*$ is associative (b) $*$ is commutative
(c) there exists identity element with respect to $*$
(d) every element of G has inverse with respect to $*$

3. If a graph contains a circuit which crosses each vertex in the graph exactly once, then such circuit is called

(a) Hamiltonian circuit (b) Euler circuit (c) Simple circuit (d) None of above

4. The adjacency matrices of two graphs are identical only if the graphs are _____

(a) Simple (b) Isomorphic (c) Bipartite (d) Complete

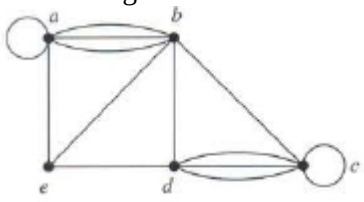
5. The length of the path a, b, c, d, e, f

(a) 4 (b) 6 (c) 5 (d) 0

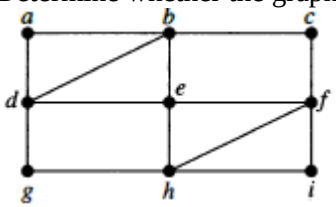
6. (R, x) is not group. (True/ False)
7. The adjacency matrix of a pseudo-graph is a symmetric matrix. (True/ False)
8. Two graphs with same vertices and same edges are always isomorphic. (True/ False)
9. A literal is defined to be a Boolean variable or its complement. (True/ False)
10. A graph with a vertex of degree one can have a Hamiltonian circuit. (True/ False)

Q.2 Answer the followings (any five) **(15)**

1. Without using truth table **s**how that $\neg(p \vee (\neg p \wedge q))$ and $\neg p \wedge \neg q$ are logically equivalent.
2. If *R* is the relation of $A=\{1,2,3,4\}$ such that $(a,b) \in R$, if and only if $a+b=even$, Find the relational matrix M_R.
3. Find the order of every element of the multiplication group $G = \{a, a^2, a^3, a^4, a^5, a^6 = e\}$, where *e* is the identity element.
4. Find the complement of the function $F(x, y, z) = xy + \bar{x}y + y\bar{z}$
5. Find the degree of each vertex and verify Handshaking theorem.

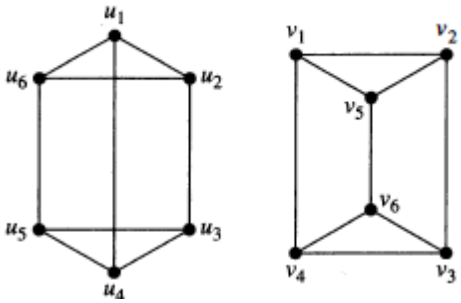


6. Determine whether the graph has an Euler circuit or an Euler path, if it exists, construct it.



Q.3 Answer the following **(Any three)** **(15)**

1. If $*$ is defined on R such that $a*b=a+b-2ab$ for $a,b \in R$, show that $\{R,*\}$ is an abelian group.
2. Without the using the table ,find the sum of products expansion of $F(x,y,z)=(x+y)\bar{z}$
3. Determine whether the given graphs are isomorphic or not? Justify by giving appropriate reasons.



4. Use the method of contradiction; prove that $\sqrt{2}$ is not a rational number.

Q.4 Answer the following

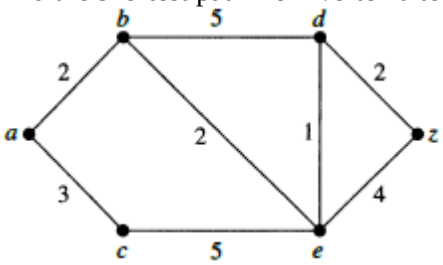
A. Represent the POSET $(P,\leq), P=\{2,3,6,12,24,36\}$ and $\leq$: divides by Hasse diagram. Also find the upper and lower bounds and least upper bound and greatest lower bound if they exist. **(05)**

B. 1. Use rules of inference to show that the hypotheses "Randy works hard," "If Randy works hard, then he is a dull boy," and "If Randy is a dull boy, then he will not get the job" imply the conclusion "Randy will not get the job." **(10)**

2. Check whether the "greater than or equal to" ($\geq$) relation is a partially ordered set or not in set of integers Z.

OR

B. 1. Find the shortest path from vertex a to vertex z of the graph by using Dijkstra's Algorithm **(10)**



2. Show that the set of rational numbers Q with $*$ as the binary operation defined by $a*b=\frac{ab}{2}$ is an abelian group.