Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER– 1 EXAMINATION – WINTER 2018

Subject Code: 2610003 Date: 03-01-2019

Subject Name: Discrete Mathematics for Computer Science

Time: 10.30 am to 1.00 pm Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 (a)1. Answer the following: **4**

1. Express the following using predicate, quantifier and logical connectives. Also verify the validity of the consequence.
   Everyone who graduates gets a job.
   Ram is graduated.
   Therefore, Ram got a job.

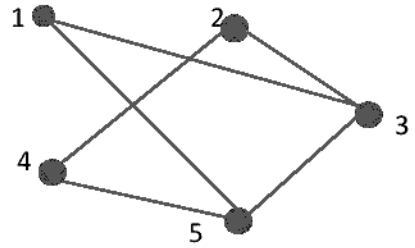
2. Prove ny contradiction that √2 is an irrational number. **3**

(b) Draw Hasse Diagram of the poset({2,3,5,6,9,15,24,45},D). Find **7**

1. Maximal and Minimal elements.
2. Greatest and Least members, if exist.
3. Upper bound of {9,15} and l.u.b. of {9,15},if exist.
4. Lower bound of {15,24} and g.l.b. of {15,24}, if exist

Q.2(a)1. Define a binary relation. Let X = {1,2,3,4,5,6} and R = {(x,y) | x+y = 6 } be a relation define on x. Write properties of R. Justify your answer. **4**

2. Define a maximal compatibility block. Write maximal compatibility blocks of the compatibility relation given in figure. **3**



(b) 1. Define a group. Show that $(Z_7, +_7)$ is a group. Write all the sub group of $(Z_7, +_7)$. **4**

2. Show that ({[1],[4],[1,3],[1,6]},X_{17})is a sub group of (Z^*_{17},X_{17}). **3**

OR

(b)1. Give an example of **4**

1. A bounded lattice which is complemented but not distributed.
2. A bounded lattice which is distributed but not complemented.
3. A bounded lattice which is neither distributed nor complemented.
4. A bounded lattice which is both distributive and complemented.

2. Two equivalence relation R and S are given by their relation matrices M_R and M_S. Show that R®S is not an equivalence relation. **3**

MR = | 1 1 0|
| 1 1 1 |
| 0 0 1 |

MS = | 1 1 0 |
| 1 1 1 |
| 0 1 1 |

Q.3 (a) 1. Show by truth table that the following statement formula is a Tautology. **4**
((p ->q) ^(q -> r))->(p->r)

2. Test whether the given argument is logically valid: **3**
If chris studies, then he will pass the class test. If chris does not play cards, then he will study. Chris did not pass in the class test. Therefore, chris played cards.

(b) 1. Define isomorphic lattices. Draw the Hasse diagram of lattices. **3**

1. (S_4× S_{25} ,D) 2. (S_{36},D)

Check whether lattices are isomorphic?

2. Define complemented lattice. Which of two lattice< S_n, D> for n = 30 and n = 45 are complemented? Draw Hasse Diagram of these lattices. Are these lattices distributive? Justify your answer. **4**

OR

Q.3 (a) Define cyclic group. Write down the properties of cyclic group. Show that <Z_6, $+_6$> is a cyclic group of order 6 and also find its generators. **7**

(b) Find a minimal sum of product form using K-map: **7**

1. α(x,y,z) = xyz + xyz' + x'yz '+ x'y'z
2. α(x,y,z) = xyz + xyz' + xy'z + x'yz + x'y'z

Q.4 (a) Use Quine – McCluskey method to find a minimal sum of product expression of each of the following function: **7**

1. f(a,b,c,d) = Σ(0,1,2,3,13,15)
2. f(a,b,c,d) = Σ(10,12,13,14,15)

(b) 1. Define a Boolean algebra. Show that in a Boolean algebra, **4**
A = b ↔ ab' + a'b = 0

2. Show that the Boolean expression **3**

1. (x ⊕ y) * (x' ⊕ z) * (y ⊕ z)
2. (x * z) ⊕ (x' * y) are equivalent to each other.

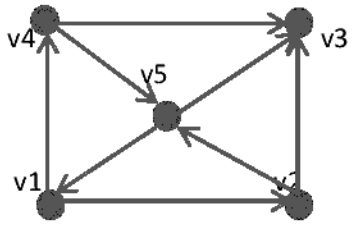
OR

Q.4 (a) Define sub Boolean Algebra. Find all sub-algebras of Boolean algebra<S_{30},*,⊕,',0,1>,Write proper step. **7**

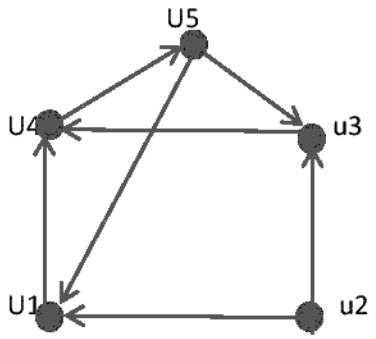
(b) 1. Define Join Irreducible element, Meet irreducible element, Atom and Anti atom **4**

2. Explain Stone's Representation theorem with proper examples. **3**

Q.5(a) 1. Define Isomorphic graph.State whether the following diagraphs are isomorphic or not.Justify your answer. **4**

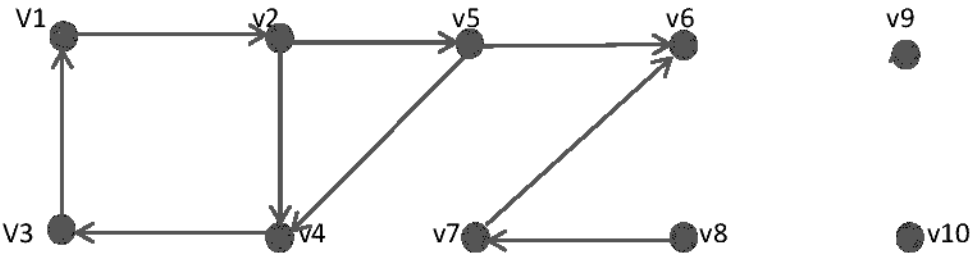


Graph 1



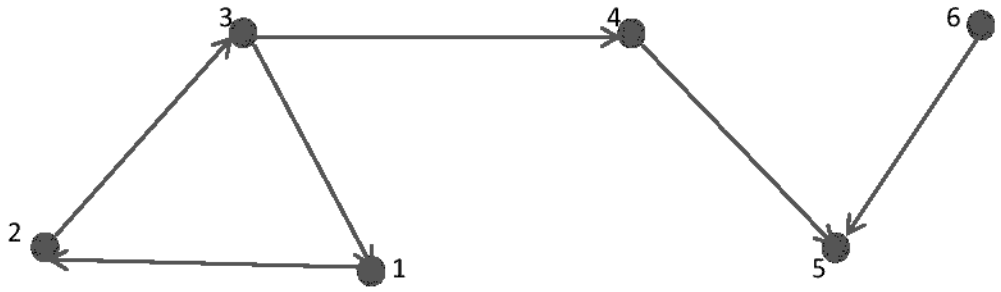
Graph 2

2. Define Nodebase. Is the set{v5,v8,v9,v10} a node base for the following diagraph?Justify your answer. **3**



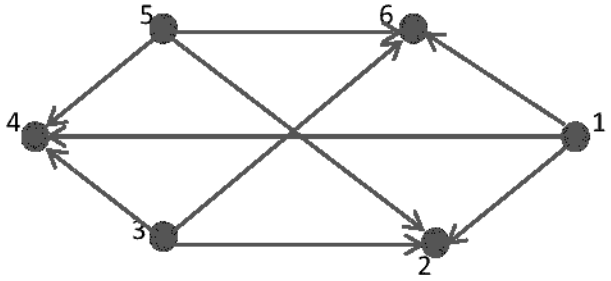
(b) 1. Define weakly connected, unilaterally connected and strongly connected graphs. **3**

2. Define weak,unilateraly and strong components. Find the strong,unilateraly and weak component for the following diagraph. **4**



OR

Q.5(a) Define : Path, simple Path, elementary Path. For the graph given in the figure **7**



1. Find an elementary path of length 2 from 1 to 3.
2. Find a simple path from 1 to 3, which is not elementary.
3. Find all possible paths from node 2 to 4 and how many of them are simple & elementary?

(b) Define a directed tree. Draw the graph of the tree represented by (A(B(C(D)(E))(F(G)(H)(J)))(K(L)(M)(N(P)(Q(R))))) Obtained the binary tree corresponding to it. **7**

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