

Time: 3 Hours

FEBRUARY 2012

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE:

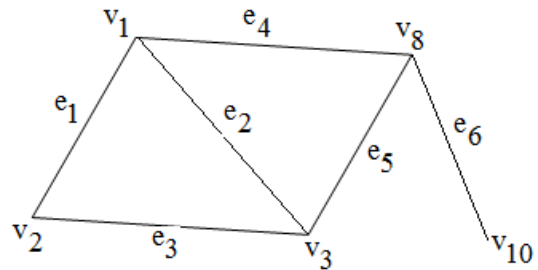
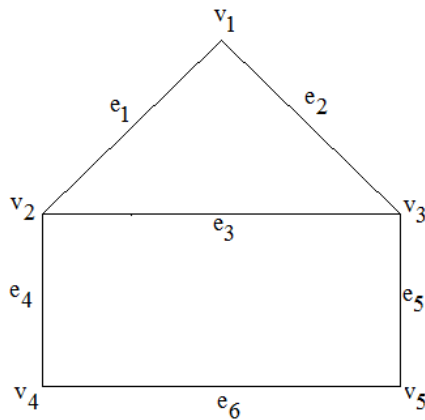
- Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.
- Parts of a question should be answered at the same place.

Q.1 a. Construct truth table for both

- (i) $p \vee \sim q$
- (ii) $(p \vee q) \vee \sim p$

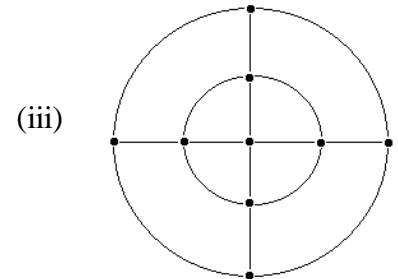
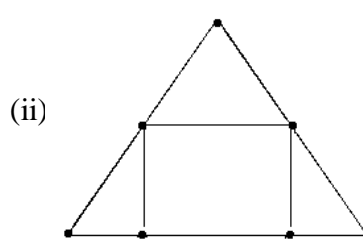
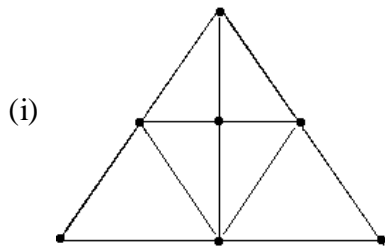
b. If a, b, c are the elements of a Boolean algebra B , then prove that $\forall a, b, c \in B$
 $a + (a'c + b) = (a + a'c) + b$

c. If G_1 & G_2 are two graphs given as below:

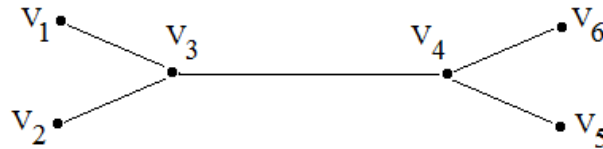


find $G_1 \cup G_2$, $G_1 \cap G_2$, $G_1 \oplus G_2$

d. Find which of the following graph shown as below are traversable?



- e. Define the properties of tree. What is directed tree? Explain with example.
- f. Find the eccentricity of each of the vertices in the graph given below. Also find the centre of the graph.



- g. What is “Pigeonhole Principle”? (7 × 4)

Q.2 a. Prove that the following is a valid argument:

$$(p \Rightarrow q) \vee r \equiv (p \vee r) \Rightarrow (q \vee r) \quad (9)$$

b. Check the validity of the argument:

$$p \Rightarrow q$$

$$\frac{r \Rightarrow \neg q}{p \Rightarrow \neg r}$$

(9)

Q.3 a. What is laws of operations on set? Write any five of such laws. (9)

b. If two relations R_1 & R_2 are such that

$$R_1 = [(1,3), (2,1), (3,4)]$$

$$\& R_2 = [(1,2), (4,3), (3,4)]$$

Then find $R_2 \circ R_1$, where \circ represents composition of relations. (9)

Q.4 a. If R is an equivalence relation on set A then prove that R^{-1} is also an equivalence relation on A . (9)

b. If a and b are arbitrary elements of a Boolean algebra B then prove $(a + b)' = a'b'$ (9)

Q.5 a. What is graph? Explain the following terms:

(i) Complete graph.

(ii) Regular graph.

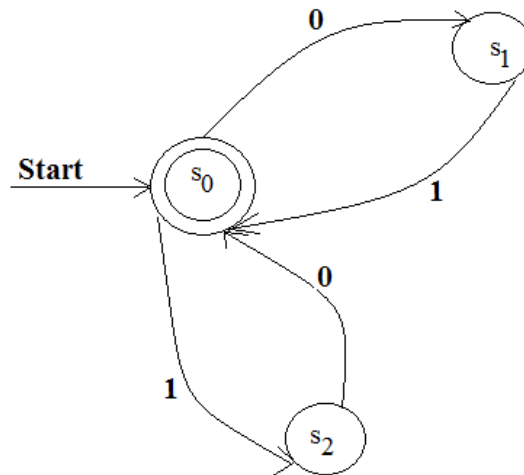
(iii) Traversable multi-graph. (9)

b. What is incidence matrix? Write the properties of incidence matrix with some suitable example. (9)

Code: CT22

Subject: DISCRETE MATHEMATICAL STRUCTURES

- Q.6** a. What is Kruskal's algorithm? Explain the algorithm with a suitable example. (9)
- b. Prove a graph G is a tree iff it is minimally connected. (9)
- Q.7** a. Write the language of DFA that accept the strings of 0's and 1's, that have the sequence 0 1 somewhere in the string and prove that the language does not represent any other string. (9)
- b. Consider a NFA, whose transition graph is given below:



Find

- (i) Initial state
- (ii) State set
- (iii) Input set
- (iv) State table defining the transition function. (9)