PVP 20

Code: 20BS1303

II B.Tech - I Semester – Regular Examinations - FEBRUARY 2022

DISCRETE MATHEMATICAL STRUCTURES

(Common for CSE, IT)

Duration: 3 hours Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

UNIT – I

1. a) Construct the truth table for the following proposition. 7 M

$$[(p \rightarrow r) \wedge (q \rightarrow r)] \rightarrow \big((p \vee q) \rightarrow r\big).$$

b) Find the principal disjunctive normal form of the following expression. 7 M

$$p \rightarrow [(p \rightarrow q) \wedge \neg(\neg q \vee \neg p)].$$

OR

2. a) Prove that the following equivalent formulas by using truth tables. 7 M

(i) $p \vee (p \wedge q) \Leftrightarrow p$.

(ii) $p \vee (\neg p \wedge q) \Leftrightarrow (p \vee q)$.

b) Find the principal conjunctive normal form of the following expression. 7 M

$$(\neg p \vee \neg q) \rightarrow (p \rightleftarrows \neg q).$$

UNIT – II

3. a) Show that, “w” is a valid conclusion from the following premises. 7 M

$\neg t \rightarrow \neg r$, $\neg s$, $t \rightarrow w$, and $r \vee s$.

b) Verify the validity of the following argument. 7 M

Premises: All fathers are males.

Some students are fathers.

Conclusion: All students are males.

OR

4. a) Verify the validity of the following argument. 7 M

Premises : If the patient has a virus, then he must have a temperature above 99^0.

The patient's temperature is not above 99^0.

Conclusion: The patient has a virus.

b) Show that 7 M

$$(\exists x)\ (\,p(x) \wedge q(x)\,) \Rightarrow (\exists x)\ p(x) \wedge (\exists x)\, q(x).$$

UNIT-III

5. Solve the recurrence relation 14 M

$$a_{n+1} - 10\, a_n + 9\, a_{n-1} = 5 \times 9^n\,, \quad n \geq 1,$$

where $a_0 = 1,\ a_1 = 4.$

OR

6. Solve the recurrence relation 14 M

$$a_{n+2} - 6\, a_{n+1} + 9\, a_n = 10 \times 3^n\,, \quad n \geq 0\,.$$

UNIT – IV

7. a) (i) Define an equivalence relation. 7 M

(ii) Let A be the set of positive integers and R be a relation on A defined by

$$R = \{\,(a,b) \mid a\ divides\ b\}.$$

Then verify R is an equivalence relation or not.

b) Define the Hasse diagram of a poset and draw the Hasse diagram of the poset $[P(X), \subseteq]$. 7 M

Where $X = \{\,a, b, c\}$ and $P(X)$ is the collection of all subsets of X.

OR

8. a) Define transitive closure of a relation and find the transitive closure of the relation R, where $R = \{ (a,b),(b,c),(c,d),(d,e),(e,a)\}$. 7 M

b) Let $A = \{ 1,2,3,4,5 \}$ and R be a relation on A defined by $R = \{ (x,y) \mid x \geq y \}$. Then verify R is a partial order relation or not. 7 M

<u>UNIT – V</u>

9. a) Define the following with an example. 7 M

(i) degree of a vertex

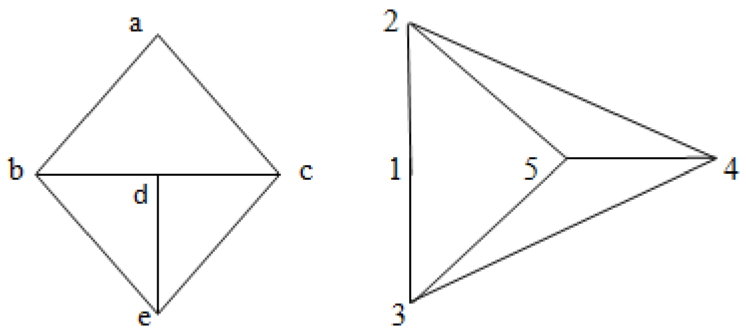
(ii) complete graph

(iii) plane graph.

b) Explain Breadth First Search algorithm with an example. 7 M

OR

10. a) Verify the following graphs are isomorphic or not. 7 M



b) Define tree and draw at least 5 trees with 6 vertices. 7 M