

[27]

**SARDAR PATEL UNIVERSITY****Master of Computer Application**

Semester – I External Examinations, November 2018

**PS01FMCA01 – Mathematical Foundation of Computer Science**Tuesday, 20<sup>th</sup> November, 2018

Time: 10:00 a.m. to 01:00 p.m.

Max Marks: 70

**Q1. Choose the most appropriate option for each question.**

[8]

- i. For any statement P, the statement  $P \vee \neg P$  is a \_\_\_\_\_ and  $P \wedge \neg P$  is a \_\_\_\_\_.
- A) tautology, contradiction  
B) contradiction, tautology  
C) tautology, tautology  
D) contradiction, contradiction
- ii. If P is false and Q is false, then  $P \rightarrow Q$  is \_\_\_\_\_ and  $P \Leftrightarrow Q$  is \_\_\_\_\_.
- A) true, true  
B) true, false  
C) false, true  
D) false, false
- iii. If logical operator AND is used then True AND False will return \_\_\_\_\_.
- A) False  
B) True  
C) -1  
D) 0
- iv. For a matrix A having matrix B as its inverse which of the following is true?
- A)  $A+B=0$   
B)  $A-B=0$   
C)  $A \times B = I$   
D) None of these
- v. A graph in which there is an edge between every pair of vertices is called \_\_\_\_\_ graph.
- A) Connected  
B) Regular  
C) Tree  
D) Complete
- vi. Which of the following component is not part of a simple graph?
- A) Vertex  
B) Edge  
C) Loop  
D) None of Above
- vii. A graph in which there is at least one path between every pair of vertices is called \_\_\_\_\_ graph.
- A) Connected  
B) Regular  
C) Tree  
D) Complete
- viii. A tree with  $n$  vertices has \_\_\_\_\_ edges.
- A)  $n$   
B)  $n-1$   
C)  $n(n-1)$   
D)  $n(n+1)$

**Q2. Answer the following questions (Any Seven):**

[14]

- a. Use truth table to check whether  $(P \wedge Q) \rightarrow P$  is a tautology or not.
- b. For atomic variables P, Q, R, write all maxterms.
- c. Explain transpose operation in matrix with an example.
- d. Find the determinant of the matrix  $A = \begin{vmatrix} 2 & -2 \\ 6 & 5 \end{vmatrix}$ .
- e. What is degree of a vertex?
- f. What do you mean by vertex disjoint sub-graphs?
- g. Define the term "Graph".
- h. What is travelling salesman problem?
- i. Define rank and nullity of a graph.

①

(P.T.O.)

**Q3. Answer the following questions:**

a. Find the disjunctive normal form of the function f given below: [6]

$x_1$	$x_2$	$x_3$	f
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

b. Given the truth values of P and Q as T and those of R and S as F, find the truth value of the following: [6]

$$(\neg (P \wedge Q) \vee \neg S) \vee ((P \Rightarrow \neg Q) \rightarrow (R \vee \neg S))$$

OR

b. Use truth tables to show that  $\neg (P \wedge Q) = \neg P \vee \neg Q$ . [6]

**Q4. Answer the following questions:**

a. List the steps required to prove mathematical statement using principle of mathematical induction. Also check that, if n is a positive integer then  $1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$  using principle of mathematical induction. [6]

b. Explain logical operator NAND, NOR, NOT using truth table. Also check that  $\overline{A + B} = \bar{A} \times \bar{B}$  is valid or not using truth table. [6]

OR

b. Solve the following system of equation using Gaussian Elimination method. [6]

$$\begin{aligned} 2x + 6y + 8z &= 16 \\ 4x + 15y + 19z &= 38 \\ 2x + 0y + 3z &= 6 \end{aligned}$$

**Q5. Answer the following questions:**

a. Explain Konigsberg Bridge Problem and its solution using Euler graph. [6]

b. Write a note on isomorphic graphs. [6]

OR

b. Explain the terms walk, path, and circuit, with suitable example. [6]

**Q6. Answer the following questions:**

a. What is the purpose of Kruskal's algorithm? Explain the working of Kruskal's algorithm by giving suitable example. [6]

b. What is Hamiltonian path and Hamiltonian circuit? Give example of each. [6]

OR

b. Explain any three operations on graph by giving example. [6]

