S.No. 389 BATCH: 2009-2018 Reg.No.

END OF SEMESTER EXAMINATIONS, APRIL / MAY - 2019
MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE
SUBJECT CODE: 11UBIT03

MAJOR : B.Sc., (IT) **SEMESTER : I**
TIME : 3 HOURS **MAX.MARKS : 75**

SECTION – A (5 X 2 = 10)

Answer ALL Questions:

1. Let A be any square matrix. Prove that $A+A^T$ is Symmetric.
2. Prove that the union of sets is associative.
3. Give an example of a relation that is reflexive but neither symmetric nor transitive.
4. Define a complete graph.
5. Show that the statement $p \vee \sim p$ is a tautology.

SECTION – B (5 X 4 = 20)

Answer ALL Questions:

6. a) If $A=\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ show that $A^2-4A-5I=0$.

(OR)

b) Show that a square matrix A is orthogonal iff $A^{-1}=A^T$.

7. a) If $\cup=\{0,1,2,3,4,5\}$, $A=\{0,1,2\}$ and $B=\{2,4\}$ prove that (i) $(A\cup B)^C=A^C\cap B^C$ and (ii) $(A\cap B)^C=A^C\cup B^C$.

(OR)

b) If A, B and C are any three sets prove that (i) $A-(B\cup C)=(A-B)\cap(A-C)$ (ii) $A-(A-B)=A\cap B$.

8. a) Define a binary relation and inverse relation.

(OR)

b) Show that the relation '$\subseteq$'(subset) defined on the power set $P(A)$ of the set A is a partial order relation.

9. a) Draw a diagram for each of the following graph $G(V,E)$.

(i) $V=\{a,b,c,d,e,f\}$. $E=\{(a,d),(a,f),(b,e),(b,f),(c,e)\}$

(ii) $V=\{a,b,c,d,e\}$, $E=\{(a,d),(b,c),(b,d),(b,e),(d,e),(c,e)\}$.

(OR)

b) Show that the maximum number of edges in a complete bipartite graph with 'n' vertices are $n^2/4$.

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10. a) With the help of the truth table, prove that $\sim p \vee \sim q \equiv \sim(p \wedge q)$.

(OR)

b) Prove that $p \Rightarrow q \equiv \sim q \Rightarrow \sim p$.

SECTION – C (3 X 15 = 45)

Answer any THREE Questions:

11. Compute the inverse of the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix}$.

12. Determine the number of integers between 1 and 250 that are divisible by any of the integers 2,3.5 and 7.

13. (i) Given a finite set with n elements. Find how many relations are on A and how many of these are reflexive and symmetric.

(ii) If R and S are relations from A to B, prove that

(a) $R^{-1} \subseteq S^{-1}$ *when* $R \subseteq S$

(b) $(R \cap S)^{-1} = R^{-1} \cap S^{-1}$

(c) $(R \cup S)^{-1} = R^{-1} \cup S^{-1}$.

14. (i) Prove that a simple graph G with n vertices and K components cannot have more than $\frac{1}{2}(n-k)(n-k+1)$ edges.

(ii) If a simple graph G with n vertices has more that $\frac{1}{2}(n-1)(n-2)$ edges prove that G is connected.

(iii) Draw the connected regular graphs of degree 0,1 and 2.

(iv) Draw two 3-regular graphs with six vertices.\

15. (i) If p, q and r are three statements, show that $[(p \Rightarrow q) \wedge (q \wedge r)] \Rightarrow (p \Rightarrow r)$. Also write its truth set.

(ii) Using the truth table prove that a) $p \vee (q \vee r) \equiv (p \vee q) \vee r$ and b) $p \wedge (q \wedge r) \equiv (p \wedge q) \wedge r$.

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