A–8976	Sub. Code 4BITSA1

U.G. DEGREE EXAMINATION, NOVEMBER 2019

Information Technology

Allied — DISCRETE MATHEMATICS

(CBCS – 2014 onwards)

Time : 3 Hours Maximum : 75 Marks

Section A $(10 \times 2 = 20)$

Answer **all** questions.

1. Define a conditional statement and draw its truth table.

2. Construct the truth table for $\neg(\neg P \wedge \neg Q)$.

3. Define elementary sum.

4. What is meant by free variable and bound variable?

5. Define graph.

6. What is unilaterally connected graph?

7. What is cut-vertex?

8. What is meant by forest?

9. Define lattice.

10. What is meant by covering of a set?

Section B $(5 \times 5 = 25)$

Answer **all** questions.

11. (a) Show that $Q \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$ is a tautology.

Or

(b) Write short notes on atomic and compound statements.

12. (a) Obtain a disjunctive normal form of

$P \rightarrow ((P \rightarrow Q) \wedge \neg(\neg Q \vee \neg P))$

Or

(b) Show that $R \rightarrow S$ can be derived from the premises $P \rightarrow (Q \rightarrow S)$, $\neg R \vee P$ and Q.

13. (a) Show that in a simple diagraph $G = <V, E>$, every mode of the diagraph lies in exactly one strong component.

Or

(b) Discuss the special classes of graphs with examples.

14. (a) Prove that a graph is a tree if and only if it is minimally connected.

Or

(b) Explain briefly Dijkstra's algorithm.

15. (a) Discuss the properties of sub lattices.

Or

(b) In a distributive lattice prove that

$a \wedge b \leq x \leq a \vee b$ is equivalent.

Section C (3 × 10 = 30)

Answer any **three** questions.

16. (a) Show that

$$((P \vee Q) \wedge \neg(\neg P \wedge (\neg Q \vee \neg R))) \vee (\neg P \wedge \neg Q) \vee (\neg P \wedge \neg R)$$

is a tautology.

(b) Establish that

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

17. Show that $(\forall x)(P(x) \vee Q(x)) \Rightarrow (\forall x\, P(x) \vee (\exists x) Q(x))$

18. Explain Isomorphism with illustrations.

19. Prove that a connected graph G is Eulerian if and only if can be decomposed into cycles.

20. Prove that

(a) Every chain is a lattice

(b) Any chain is modular.