SUMMER – 2023

UNIT-1

Q.1 a) Explain following terms in brief.

i) Predicates and quantifiers.

ii) Precedence of quantifier.

iii) Logical equivalences involving quantifiers.

iv) Negating quantified expressions. **(6)**

b) Show that $\neg(p \vee(\neg p \wedge q))$ and $\neg p \wedge \neg q$ are logically equivalent by developing a series of logic equivalence. **(7)**

Q.2 a) Show that each of these conditional statements is a tautology by using truth tables.

i) $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$

ii) $[p \wedge (p \rightarrow q)] \rightarrow q$

iii) $[(p \vee q) \wedge (p \rightarrow r) \wedge (q \rightarrow r)] \rightarrow r$ **(7)**

b) Show that $(p \wedge q) \rightarrow r$ and $(p \rightarrow r) \wedge (q \rightarrow r)$ are not logically equivalent. **(6)**

UNIT-2

Q.3 a) What is the function and composition of function? Explain its basic types with examples. **(7)**

b) What is relation and its basic properties with examples? **(7)**

Q.4 a) Let A = {a, b, c}, B = {x, y} and C = {0, 1}

Find:

i) $A \times B \times C$ ii) $C \times B \times A$

iii) $C \times A \times B$ iv) $B \times B \times B$ **(7)**

b) Describe the valuable terms with examples.

i) Set. ii) Venn diagram.

iii) Countable set. iv) Power set. **(7)**

UNIT-3

Q.5 a) What are the properties of Abelian Group? **(6)**

b) What is coset & Lagrange Theorem? **(7)**

Q.6 a) What is the group in algebraic structure? Is the group H = $<Z_{10}, +>$ a subgroup of the group G = $<Z_{12}, +>$?. **(7)**

b) What is hamming distance in algebraic structure? **(6)**

UNIT-4

Q.7 a) What are the logic gates, symbols and operations? **(6)**

b) Draw the K-maps of these sum-of-products expansions in two variables.

i) $x\bar{y}$ ii) $xy + \bar{x}\bar{y}$ iii) $xy + x\bar{y} + \bar{x}y + \bar{x}\bar{y}$ **(7)**

Q.8 a) Explain how k-maps can be used to simplify sum-of-products expansions in three Boolean variables. **(7)**

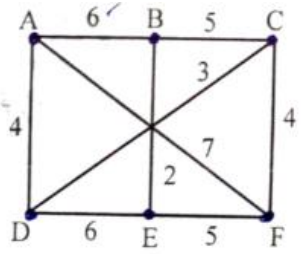
b) Explain representing Boolean functions and sum of product expansions with example. **(7)**

UNIT-5

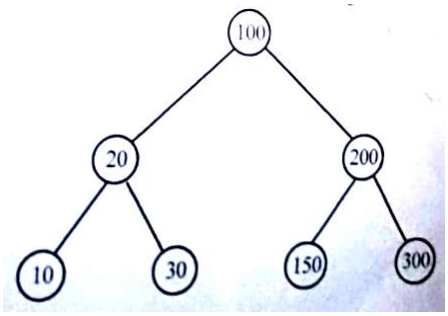
Q.9 a) Explain prefix notation, postfix notation and infix notation. **(6)**

b) What are the properties and application of trees? **(7)**

Q.10 a) Determine the minimum spanning tree of the weighted graph shown in figure. **(7)**

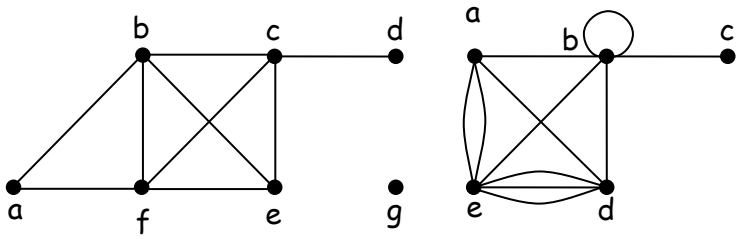


b) Find out preorder, post order, in order traversal of following tree. **(6)**



UNIT-6

Q.11 a) What are the degrees and what are the neighborhoods of the vertices in the graph G and H displayed in figure? **(7)**



b) What is the planar graph? Explain with diagram. **(7)**

Q.12 a) What is Euler's & Hamilton path in graph? Explain with diagram. **(7)**

b) Find the in-degree and out-degree of each vertex in the graph G with directed edges shown in figure. **(7)**