WINTER-2012

UNIT 1

Q.1 a) Obtain PDNF **(7)**

i. $(P \wedge Q) \vee (\urcorner P \wedge R) \vee (Q \wedge R)$

ii. $\urcorner(P \vee Q) \leftrightarrow (P \wedge Q)$

b) What is well formed formula? What are the rules for well formed formula? Explain with suitable example. **(6)**

Q.2 a) Show the following equivalence **(6)**

i. $(((Q \wedge A) \rightarrow C) \wedge (A \rightarrow (P \vee C))) \Leftrightarrow ((A \wedge (P \rightarrow Q)) \rightarrow C)$

ii. $(A \rightarrow (P \vee C)) \Leftrightarrow (A \wedge \urcorner P) \rightarrow C$

b) Show the following implication without truth table.

i. $(P \rightarrow Q) \Rightarrow (P \rightarrow (P \wedge Q))$

ii. $((P \rightarrow Q) \rightarrow Q) \Rightarrow (P \vee Q)$ **(6)**

UNIT 2

Q.3 a) Show that $R \wedge (P \vee Q)$ is valid conclusion for premises $P \vee Q$, $Q \rightarrow R$, $P \rightarrow M$ and $\urcorner M$ using rules of inference. **(6)**

b) i. Show that $\urcorner(P \wedge Q)$ follows from $\urcorner P \wedge \urcorner Q$ using indirect proof method.

ii. Show the following premises are inconsistent

$E \rightarrow S$, $S \rightarrow H$, $A \rightarrow \urcorner H$, $E \rightarrow A$. **(7)**

Q.4 a) Show $S \vee R$ is tautologically implied by $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$. **(7)**

b) Show that the conclusion C follows from premises H_1, H_2… in the following cases using truth table

i. $H_1 : (P \vee Q)$, $H_2 : P \rightarrow R$, $H_3 : Q \rightarrow R$, $C : R$

ii. $H_1 : \urcorner Q$, $H_2 : P \rightarrow Q$, $C : \urcorner P$ **(6)**

UNIT 3

Q.5 a) Define the terms with example

i. Equal Set, **ii.** Power Set,

iii. Relative Complement, **iv.** Absolute Complement. **(6)**

b) Draw the Venn diagram **(7)**

i. $A \cap B = A \cap C$ but $B \neq C$

ii. $A \cup B = A \cup C$ but $B \neq C$

iii. $A \cap B = A \cap C$ but B is not subset of C.

Q.6 a) Show that: **(6)**

i. $A \rightarrow B \Leftrightarrow A \cap \sim B$

ii. $A \subseteq B \Leftrightarrow \sim B \subseteq \sim A$

b) Let $S = \{s, a, \{3\}, 4\}$

$R = \{\{a\}, 3, 4, 1\}$

Determine whether the following is true or not:

i. $\{a\} \in S$ **ii.** $\{a\} \subseteq R$ **iii.** $\{a, 4, \{3\}\} \subseteq R$

iv. $\{\{a\}, 1, 3, 4,\} \subset R$ **v.** $\phi \in R$ **vi.** $\{a\} \in R$

vii. $R = S$ **(7)**

UNIT 4

Q.7 a) Define the algebraic system

i. $<z_4 *4, +4>$ **ii.** $< z_6^* + 6 >$, where, $z_6^* = z_6 - \{[0]\}$. **(6)**

b) Explain the following terms:

i. Semigroup. **ii.** Monoid. **iii.** Group.

iv. Direct product of group. **v.** Algebraic structure. **(6)**

Q.8 a) Let $<G, *>$ is group where $G = \{\alpha, \beta, \gamma, \delta\}$ and $*$ is given by composition table as **(6)**

$*$	α	β	γ	δ
α	α	β	γ	δ
β	β	α	δ	γ
γ	γ	δ	β	α
δ	δ	γ	α	β

Find out identify element and inverse of each element of group.

b) Show that with every element in a group is its own inverse then group must be abelian group. **(7)**

UNIT 5

Q.9 a) What do you mean by lattice as partially ordered set?

let x = {2, 3, 6, 12, 24, 36} and

relation $\leq$ is given as $x \leq y$ if x divides y. Draw the diagram for $< x, \leq >$ and determine whether it is lattice or not and why? **(7)**

b) Simplify the following Boolean identities: **(7)**

i. $(a * b)' \oplus (a \oplus b)'$

ii. $(a' * b' * c) \oplus (a * b' * c) \oplus (a * b' * c')$

iii. $(a \oplus b') * (b \oplus c') * (c \oplus a')$

Q.10 a) Prove the following Boolean identities: **(7)**

i. $a \oplus (a' * b) = a \oplus b$

ii. $a * (a' \oplus b) = a * b$

iii. $(a * b) \oplus (a * b') = a$

iv. $(a * b * c) \oplus (a * b) = a * b$

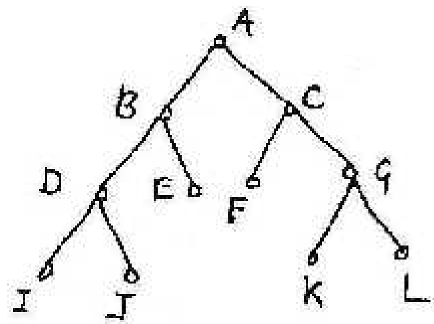
b) Obtain the sum of product canonical form of following using variables x_1, x_2, x_3 **(7)**

i. $(x_1 + x_2)' + (x_1' * x_3)$

ii. $x_1 + x_2$

UNIT 6

Q.11 a) Traverse the following with three techniques, Inorder, preorder and post order. **(7)**



b) Define the terms with Example: **(7)**

i. Strongly Connected Graph.

ii. Weakly Connected Graph.

iii. Simply Graph.

iv. Degree of Graph.

Q.12 a) Show that in a complete binary tree the total number of edges is given by $2(n_t - 1)$ where n_t is total number of terminal nodes. **(7)**

b) What do you mean by Isomorphic Graph? Determine whether the given graphs are isomorphic or not and why. **(7)**