UNIT - I

1. S.T $R \vee S$ follows logically from premises $C \vee D$, $(C \vee D) \to \sim H$, $\sim H \to (A \wedge \sim$ and $(A \wedge \sim B) \to (R \vee S)$

a) Define tautology, contradiction and contingency of formula

(b) express $p \leftrightarrow q$ in terms

(i) implication and AND

(ii) AND, OR, NOT

(iii) EX-OR.

(c) write truth table for $(p \leftrightarrow \sim q) \to (p \wedge q)$

(d) verify whether the following inference is valid or not

Statement 1: if today is 2nd october then today is Gandhiji's Birthday

Statement 2: today is not 2nd october

Statement 3: today is not Gandhi's Birthday.

(e)(i) obtain pdnf of $p \vee (\sim p \to (q \vee (\sim q \to r)))$

(ii) show that the following statements are logically equivalent without using truth table.

$$(P \to R) \wedge (Q \to R) \Leftrightarrow (P \vee Q) \to R.$$

(f) prove logical equivalence of the expression $[\sim p \wedge (\sim q \wedge r)] \vee [(q \wedge r) \vee (p \wedge r)] = r$

(g) write the inverse and contrapositive of the statement "if $2+2=9$ then Mr. Ravi is a good teacher".

(h) write in symbolic form "It is not true that all roads lead to Rome".

(i) Test whether the following is valid argument if Sachin hits a century, then he gets a free car. Sachin does not get a free car. therefore Sachin has not hit a century.

(i) write about quantifiers.

(j) obtain pdnf and pcnf for the formula $(\sim p \vee \sim q) \rightarrow (\sim p \wedge r)$

(k) S.T the following set of premises are inconsistent

(a) if the contract is valid, the jhon is liable for penalty

(b) if jhon is liable for penalty, he will go bankrupt

(c) if the bank will loan him money, he will not go bankrupt

(d) As a matter of fact, the contract is valid and the bank will loan him money.

(l) P.T $[(p \rightarrow r) \wedge (q \rightarrow r)]$ $[(p \vee q) \rightarrow r]$ is a tautology

(m) ~~Give the truth table for propositional formula~~ ~~$(p \rightarrow \sim q)$~~

(n) show that $(\sim Q \wedge (P \rightarrow Q)) \rightarrow \sim P$ using automatic theorem proving

(n) the propositional function $((p \rightarrow q) \vee (q \rightarrow r)) \rightarrow (p \rightarrow r)$ is a tautology or not.

(o).(i) show that $\sim(P \rightarrow Q) \rightarrow \sim(R \vee S), ((Q \rightarrow P) \vee \sim R), R$ logically implies $P \leftrightarrow Q$

(ii) show that the set of following premises are inconsistent

premise 1: If today is 1st April then today is fools day

premise 2: If today is 1st April then $2+2 \neq 8$

premise 3: If today is fools' day then $2+2=8$

premise 4: Today is 1st April.

Scanned by CamScanner

UNIT-2

① Compute transitive closure of $R = \{(1,1)(1,2)(1,3)(2,3),(3,1)\}$ define over a set $S = \{1,2,3\}$.

② Write equivalence relation corresponds to the partitions $\{\{1,3\},\{2\}\}$.

③ Let $f: R \to R$ and $g: R \to R$ where R is the set of real Numbers, find fog where $f(x) = x^2 - 2$ and $g(x) = x+4$

④ S.T $(\forall x)(p(x) \wedge Q(x)) \Leftrightarrow ((\forall x)(p x)) \wedge (\forall x)(Q(x)))$ is logically valid statement

⑤ Let $X = \{$bed, ball, egg, dog, let$\}$, and R is a relation defined on set X as follows $R = \{(x,y) \mid x, y \in X$ and there is at least a common letter x and y$\}$
S.T R is a compatability relation. Draw corresponding graph and also give maximum compatability blocks for it.

7 What is lattice and write properties

⑧ Draw the hasse diagram of $\{P(A), \subseteq\}$ when $A = \{a,b,c$

(a) $A = \{a\}$

(b) $A = \{a,b\}$

(c) $A = \{a,b,c\}$

(d) $A = \{a,b,c,d\}$

⑨ P.T $(Z,*)$ is a abelian group where Z is a set of integers and binary operations $*$ is defined as

$a*b = a+b-3$

(10) Let $X = \{1,2,3,4\}$ and partition of X is given as $\{\{1,2\},\{3,4\}\}$ find the corresponding equivalence relation for given partition

(11) find the inverse of function $f(x) = x^4+5$

(12) If $A = \{1,2,3\}$ $B = \{4,5\}$ ~~for the given pattern~~ find
(i) $A \times B$ (ii) $B \times A$

(13) find the inverse of the function $f(x) = x^4+5$

(14) define lattice

(15) Verify the validity of the following argument

All men are mortal socrates is a man therefore socrates is a mortal

(16) Let $X = \{1,2,3 \ldots 10\}$, R is a relation defined on set X as follows $R = \{(x,y) / x,y \in X$ and $x-y$ is divisible by $5\}$ show that 'R' is equivalence relation.

(17) Explain properties of binary relation with examples

(18) (a) draw Hasse diagram for the relation $R = \{(x,y) / x$ divides $y\}$ on $X = \{2,3,6,12,24,36\}$

(b) find the upper bound and lower bounds of

(i) $\{2,3\}$, $\{3,4,6\}$

(19) Let $f: R \to R$ be defined by $f(x) = \begin{cases} x+7 & \text{for } x \leq 0 \\ -2x+5 & \text{for } 0 < x < 3 \\ x-1 & \text{for } x \geq 3 \end{cases}$

find (i) $f^{-1}(-10)$ (ii) $f^{-1}(8)$ (iii) $f^{-1}(6)$

(20)

III - UNIT

(1) Define monoid

(2) find the no. of permutations of the word MISSISSIPPI

(3) How many different outcomes are possible by tossing 10 similar coins.

(4) P.T $(Z, *)$ is an abelian group where Z is set of integers and binary operation $*$ is defined as $a * b = a + b + 3$

(5) find the co-eff of $x^5 y^{10} z^{10}$ in $(x - 7y + 3z)^{25}$

(6) expand using multinomial theorem $(2x - 6y - 3z)^4$.

(7) Define sum and product rule

(8) find the no. of ways of placing 10 similar ball in 6 different boxes.

(9) find the middle term of $(2x + 5)^{10}$

(10) find the co-efficient $x^3 y^4 z^5$ in the expansion $(2x + 5y - 3z)^{20}$