Questions based on Chapter 1. (kp)

Q1. What is a proposition? What are the two types of propositions?

Sentence which may either be true or false.

Simple and Compound

Q2. Explain the 5 connectives with their symbols and working.

Connective	Symbol	Working
Disjunctive	or + v	like OR
Conjunctive	and . ^	like AND
Conditional/Implication	→⇒⊃	like $\overline{a}+b$
Bi-Conditional/Equivalence	≡ ⇔	both are T or F, like pq+p'q'
Negation (not a connective)	~ ' -	like NOT

Q3. What is a truth table? What is the other name given to it?

Table showing all possible inputs and outputs. - Table of combinations.

Q4. Define the following terms:

Assertion	A (when A is true)
Negation	A' (when A is false)
Antecedent	p in p→q.
Consequent	q in p→q.
Contingency	having 0s and 1s.
Tautology	having only 1s.
Contradiction/Fallacy	having only 0s.
Consistent Statements	when ab≠0
Converse	q→p (of p→q)
Inverse	p'→q' (of p→q)
Contrapositive	q'→p' (of p→q)
WFF	well formed formula (proposition only)
Transportation	p→q = q'→p'
Modus Ponens	p . (p→q) = q
Chain Rule	if p→q and q→r then p→r
Syllogism	Drawing conclusions
Premises	Popositions used to draw conclusions

Q5. Algebraically show:

(i) Conditional Elimination $\overline{a}+b$ (ii) Bi-conditional Elimination   ab+a'b'

Q6. Give the Symbol and the Truth Table of the following operators:

GATE	Algebraic symbol	Gate Symbol	TT(output)
NOT			
AND			
OR			
XOR			
NAND			
NOR			
XNOR			

Ans. – Please see the book/notes

Q7. What is the precedence of the logical operators?

Not And Or

Q8. Enlist the following postulates/laws

Identity	a+1=1	a+0=a	a.1=a	a.0=0
Complementarity	a+a'=1	a.a'=0		
Idempotent	a+a=a	a.a=a		
Involution	a''=a			
Commutative	a+b=b+a	a.b=b.a		
Associative	a+(b+c)=(a+b)+c		a.(b.c)=(a.b).c	
Distributive	a(b+c)=ab+ac		a+(bc)=(a+b)(a+c)	
Absorption	a+ab=a	a.(a+b)=a		

Q9. What is the principle of duality?

Swap 0 1, AND OR

Q10. State and prove both the De' Morgan's Theorems.

I. $(A+B)' = A'.B'$

II. $(A.B)'=A'+B'$

Just giving 1 proof for example

A.A'=0	Law of complementarity
(A+B).(A+B)'=0	Law of complementarity
(A+B).(A'.B')	Replaced (A+B)' with its De' Morgan's equivalent
(A'.B')(A+B)	Commutative law
A'.B'.A + A'.B'.B	Distributive Law
0+0	Law of complementarity
=0	Law of identity

Q11. What is the other name given to the law of Involution?

Double inversion rule.

Q12. Differentiate between

(i) minterm and product term : all literals multiplied in minterm

(ii) maxterm and sum term : all literals added in maxterm

(iii) Gray and Binary codes: Only 1 bit changes in grey codes, many may change in binary

Q13. Give three methods with an example each of converting an SOP/POS expression to canonical form.

1. TT
2. Algebraic
3. Shortcut

(Please see class notes for details)

Q14. Give examples of expressing a canonical expression in shorthand notation.

(both POS and SOP, *m* and *M*)

Short Example

F(a,b,c)=a'b'c+a'bc+ab'c'+abc'

$=\sum(1,3,4,6)$

$=m_1 + m_3 + m_4 + m_6$

Q15. What is a Karnaugh Map? Show an example of a 2,3 and 4 variable karnaugh map.

Please see illustrations in the book

Q16. Define:
Overlapping : Cell a member of 2 or more groups
Map rolling : Map is spherical
Redundancy : All cells of a group overlapped.
Q17. State the three reduction rules.
Octet red rule : Drop 3 variables changing their values
Quad…   : Drop 2 variables changing their values
Pair   : Drop 1 variables changing their values
Q18. Give the rules for grouping in relation to
(i) Size of the group   - Should be largest
(ii) Number of groups   - Should be minimum
(iii) Overlapping and redundancy   - Overlapping =ok, Redundancy=not ok
Q19. What is the relation between ∑ and ∏.
Cells missing on one are present in another. E.g. f(a,b,c)= ∑(1,2,4,5,7) = ∏ (0,3,6)
Q20. V. Imp: Type C, Page 122, Q1-11.

[END]

Assume them to be for f(a,b,c,d) sop or pos (depending on where you feel more practice is required)

Values	Answer if SOP	Answer if POS
(0,2,3,5,6,8,9,10,11,12,14)		
(0,2,5,8,11,13,14)		
(0,1,3,4,5,7,9,10,12,13)		
(0,1,4,6,7,10,12,14,15)		
(2,5,8,10,12,13,14)		
(1,4,5,6,7,8,11,14,15)		
(1,2,5,7,9,12,13)		
(0,2,5,8,9,12,14)		
(1,3,6,7,8,10,13,14)		
(2,5,8,9,12,14)		
(2,3,4,5,6,7,10,11,13)		
(0,2,5,6,8,9,10,11,12,13)		
(2,4,5,6,7,10,13,15)		
(2,4,6,8,10,11,14,15)		
(1,3,4,6,7,9,10,12,13)		
(0,2,4,7,10,13,14)		
(2,3,6,9,12,15)		
(2,3,4,5,6,8,11,13,15)		
(0,3,6,7,8,10,11,12,13,15)		
(0,2,4,6,7,8,11,13,15)		