

University of Sargodha**BS 2nd Semester/Term Examination 2020****Subject: I.T****Paper: Digital Logic Design (ITCS-102)****Time Allowed: 2:30 Hours****(New Course)****Maximum Marks: 80****Note: Objective part is compulsory. Attempt any three questions from subjective part.****Objective Part (Compulsory)**

- Q.1.** Write short answers of the following in 2-3 lines each on your answer sheet. (2*16)
- Express +19 and -19 in sign-magnitude, 1's complement, and 2's complement.
 - Add the signed numbers: a) 1000100, 00011011, 00001110, and 00010010.
 - Perform each of the following subtractions of the signed numbers
 - 00001000 - 00000011
 - 00001100 - 11110111
 - Convert the following binary numbers to hexadecimal
 - 100101001010111
 - 1111100001101001
 - How does an exclusive-OR gate differ from an OR gate in its logical operation?
 - Apply De Morgan's theorems to each of the following expressions
 $(A + B + C)D$ (b) $\overline{AB + CD + EF}$
 - Simplify the following Boolean expression: $[A\overline{B}(C + BD) + \overline{A}B]C$
 - Convert the following Boolean expression into standard SOP form $\overline{A}B\overline{C} + \overline{A}\overline{B} + AB\overline{C}D$
 - Develop a truth table for the standard SOP expression $\overline{A}\overline{B}C + \overline{A}B\overline{C} + ABC$
 - Map the following standard SOP expression on a Karnaugh map: $\overline{A}\overline{B}C + \overline{A}B\overline{C} + AB\overline{C} + ABC$
 - Group the 1s in the following Karnaugh maps.

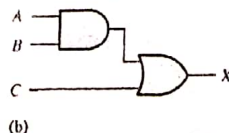
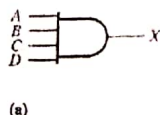
		CD	00	01	11	10
AB	00	1				1
	01	1	1			1
	11	1	1			1
	10	1		1		1

- Define Don't Care Conditions
- Identify the law of Boolean algebra upon which each of the following equalities is based

(a) $\overline{A}\overline{B} + \overline{C}D + A\overline{C}D + B = B + \overline{A}\overline{B} + A\overline{C}D + \overline{C}D$

(b) $AB\overline{C}D + \overline{A}B\overline{C} = D\overline{C}BA + \overline{C}BA$

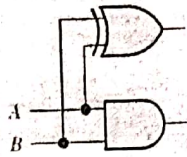
- Write the Boolean expression for each of the logic circuits.



- xv. Design a logic circuit to implement the operation specified in the following truth table.

INPUTS			OUTPUT	PRODUCT TERM
A	B	C	X	
0	0	0	0	
0	0	1	0	
0	1	0	0	
0	1	1	1	$\bar{A}BC$
1	0	0	0	
1	0	1	1	$A\bar{B}C$
1	1	0	1	$AB\bar{C}$
1	1	1	0	

- xvi. What is the functionality of the following Logic Diagram?



Subjective part (3*16)

- Q.2. Draw Full Adder Logic diagram and its truth table.
 Q.3. Draw seven segment logic diagram and its truth table
 Q.4. What is decoder? Draw truth table for four bit decoder
 Q.5. Simplify the following Boolean functions, using *Karnaugh* maps
 (a) $F(x, y, z) = \sum (2, 3, 6, 7)$ (b) $F(A, B, C, D) = \sum (4, 6, 7, 15)$
 Q.6. Obtain the simplified Boolean expressions for output F and G in terms of the input variables in the circuit given below.

