GURU NANAK INSTITUTE OF TECHNOLOGY

An Autonomous Institute under MAKAUT

2020-2021

Digital Electronics and Computer Organization

CS301

TIME ALLOTTED: 3 Hrs **FULL MARKS: 70**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable

GROUP – A

(Multiple Choice Type Questions)

Answer any ***ten*** from the following, choosing the correct alternative of each question: **10×1=10**

Marks **CO No.**

1. i) Convert the following SOP expression to an equivalent POS expression.

$A\,B\,C + A\,\overline{B}\,\overline{C} + A\,\overline{B}\,C + A\,B\,\overline{C} + \overline{A}\,\overline{B}\,C$

a. $(\overline{A} + \overline{B} + \overline{C})(\underline{A} + B + \overline{C})(\overline{A} + B + C)$

b. $(A + B + C)(A + \overline{B} + C)(A + \overline{B} + \overline{C})$ 01 CO1

c. $(\overline{A} + \overline{B} + \overline{C})(A + \overline{B} + C)(A + \overline{B} + C)$

d. $(A + B + C)(\overline{A} + B + \overline{C})(A + \overline{B} + C)$

ii) Microinstructions are kept in

a. Main memory

b. cache memory 01 CO5

c. control memory

d. none of these

iii) (A+B′+A′B)C is same as

a. 1

b. 0 01 CO1

c. C

d. C′

iv) Which of the following addressing mode is used for the instruction “Push B” ?

a. Register

b. Register indirect

c. Direct

d. Immediate 01 CO2

v)	Let $\oplus$ and $\odot$ denote the Exclusive OR and Exclusive NOR operations, respectively. Which one of the following is NOT correct? a. $(P\oplus Q)' = P\odot Q$ b. $P'\oplus Q = P\odot Q$ c. $P'\oplus Q' = P\oplus Q$ d. $(P\oplus P')\oplus Q = (P\odot P')\odot Q'$	01	CO1
vi)	The minimum number of flip flops required to design a MOD-10 counter is a. 3 b. 5 c. 4 d. 10	01	CO4
vii)	The minimum no. of NAND gates required to design one half adder circuit is a. 5 b. 8 c. 10 d. 9	01	CO3
viii)	The logic circuit in ALU is a. entirely combinational b. combinational and sequential c. entirely sequential d. none of these	01	CO2
ix)	In DMA, cycle stealing means a. Controller gets opportunity to transfer only one word in a time slot b. CPU releases the bus and DMA controller can use endlessly c. 100 bytes are allowed to be transferred d. None of these	01	CO5
x)	To construct an n-line common bus using MUX for k registers of n bits each, the number of MUXs and size of each MUX are a. k and n x1 b. n and 2^k c. n and kx1 d. k and 2^n	01	CO3
xi)	The race around condition occurs in a. JKFF b. SRFF c. Master Slave FF d. DFF	01	CO4
xii)	What is the control unit's function in the CPU? a. To transfer data to primary storage b. to store program instruction c. to perform logic operations d. to decode program instruction	01	CO2

GROUP – B
(Short Answer Type Questions)
(Answer any *three* of the following) **3 x 5 = 15**

			Marks	**CO No.**
2.	a)	Distinguish between hardware interrupt and software interrupt.	02	CO4
	b)	Explain Triggering of Flip-Flops with example.	03	CO4
3.	a)	Represent -9.5 in 32-bit IEEE floating point representation.	03	CO2
	b)	What are guard bits?	02	CO2
4.		Explain why DMA based I/O is better than interrupt driven I/O in some situations.	05	CO5
5.	a)	Distinguish between ripple counter and synchronous counter.	03	CO4
	b)	Compare parallel adder with serial adder.	02	CO3
6.		Distinguish between Hardwired control unit and micro-programmed control unit.	05	CO5

GROUP – C
(Long Answer Type Questions)
(Answer any *three* of the following) **3 x 15 = 45**

			Marks	**CO No.**
7.	a)	What is Von Neumann bottleneck?	02	CO2
	b)	Explain the logic of a 4-bit carry look ahead adder with suitable diagram.	05	CO3
	c)	Design the circuit of 3:8 Decoder and verify its truth table.	05	CO3
	d)	Design a comparator circuit with suitable truth table and diagram.	03	CO3
8.	a)	Describe JK Flip-Flop with truth table and characteristics table.	05	CO4
	b)	Construct a D flip-flop using S-R flip-flop. Explain its characteristic table and excitation table.	04	CO4
	c)	Minimize the following expression in POS form using K-map and realize the simplified expression using NOR gates only. $Y(A, B, C, D) = \Pi(0,1,4,5,6,8,9,12,13,14)$	06	CO1
9.	a)	Design a 4-bit asynchronous up-down counter.	06	CO4
	b)	Design a MOD-N synchronous binary UP-counter using JK flip-flop & other necessary logic gates.	06	CO4
	c)	Design a 4-bit bidirectional shift register.	03	CO4
10.	a)	Apply non-restoring division algorithm to divide 9 by 3.	05	CO2
	b)	Multiply 3*7 using Booth's multiplication algorithm.	05	CO2
	c)	An instruction is stored at location 300 with its address field at location 301.The address field has the value 400. A processor	05	CO2

	register R1 contains the number 200. Evaluate the effective address if the addressing mode of the instruction is (a) direct; (b) immediate; (c) relative; (d) register indirect; (e) index with R1 as the index register.		
11.	Write short notes on any three	3x5=15	
a)	IOP	05	CO5
b)	Ring counter	05	CO4
c)	SRAM and DRAM.	05	CO5
d)	DE-MUX	05	CO3
e)	Tri state buffer.	05	CO3