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Your Roll No. 2231231502 0

Sr. No. of Question Paper : 1912 G

Unique Paper Code : 3122612303

Name of the Paper : DSC-9 Computer Systems Architecture

Name of the Course : **B.Tech. IT & MI**

Semester : III

Duration : 3 Hours *Maximum Marks : 90*

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. **All** the questions are compulsory.

1. (a) Mention what are the basic components of a Microprocessor?

   (b) Mention what are the types of micro-operations?

   (c) What are the types of interrupts in a Microprocessor System?

   (d) What is full adder? List the truth table of full adder and draw the logic diagram.

P.T.O.

(e) Obtain the 9's complement of the 12349876 eight-digit decimal numbers.

(f) Convert the following numbers with the indicated bases to decimal and Hexadecimal :
$(122121)_3$; $(101101.11)_2$ and $(410)_5$.

(g) The content of a 4-bit register is initially 1101. The register is shifted six times to the right with the serial input being 101101. What is the content of the register after each shift?

(h) Simplify the following expressions in sum-of-products form :

$$X'Z' + Y'Z' + YZ' + XY$$

(i) Explain three state bus buffer.

(j) Explain why each of the following microoperations cannot be executed during a single clock pulse in the system. Specify a sequence of microoperations that will perform the operation.

(i) IR ← M[PC]

(ii) DR ← DR + AC (AC doesn't change)

(3×10=30)

2. Differentiate between the following : (5×3=15)

(a) RISC and CISC processor

(b) Combinational and sequential circuits

(c) Motherboard and Chipset.

3. (a) Design a sequential circuit with two JK flip-flops A and B and two inputs E and x. If E = 0, the circuit remains in the same state regardless of the value of x. When E = 1 and x = 1, the circuit goes through the state transitions from 00 to 01 to 10 to 11 back to 00, and repeats. When E = 1 and x = 0, the circuit goes through the state transitions from 00 to 11 to 10 to 01 back to 00, and repeats.

(b) Design a combinational circuit with three inputs x, y, z and three outputs A, B, C. When the binary input is 0, 1, 2, or 3, the binary output is one greater than the input. When the binary input is 4, 5, 6, or 7, the binary output is one less than the input. (7.5×2=15)

4. (a) Write an assembly language program to multiply two positive numbers by a repeated addition method. For example, to multiply 5*4, the program evaluates the product by adding 5 four times, or 5 + 5 + 5 + 5.

(b) Simplify the following Boolean function in product-of-sums form by means of a four-variable map. Draw the logic diagram with (a) OR-AND gates; (b) NOR gates.

$F(w, x, y, z) = (2, 3, 4, 7, 10, 14)$

$d(w, x, y, z) = (5, 6, 11, 15)$ (7.5×2=15)

P.T.O.

5. (a) An instruction is stored at location 400 with its address field at location 401. The address field at location 401 has the value 300. A processor register R1 contains the number 100. Evaluate the effective address if the addressing mode of the instruction is

(i) Direct

(ii) Immediate

(iii) Relative

(iv) Register indirect

(v) Index with R1 as the index register

(b) The following program is stored in the memory unit of the basic computer. Show the contents of the AC, PC, and IR (in hexadecimal), at the end, after each instruction is executed. All numbers listed below are in hexadecimal.

Location	Instruction
010	CLA
011	ADD 016
012	BUN 014
013	HLT
014	AND 017
015	BUN 013
016	C1A5
017	93C6

(7.5×2=15)