**2017/EVEN/08/24/MCS–203 (C)/
CS–203 (O)/559**

UG Even Semester (CBCS) Exam., May—2017

COMPUTER SCIENCE

(2nd Semester)

Course No. : MCS–203 (C)/CS–203 (O)

(Computer Organization and Architecture)

Full Marks : 75

Pass Marks : CBCS—30

Non-CBCS—26

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. *(a)* What is wrong with the following register transfer statements? 7

(i) $xT : AR \quad \overline{AR},\ AR \quad 0$

(ii) $yT : R1 \quad R2,\ R1 \quad R3$

(iii) $cT : PC \quad AR,\ PC \quad PC \quad 1$

(b) Register A holds the 8-bit binary 11011001. Determine the B operand and the logic microoperation to be performed in order to change the value in A to

(i) 01101101

(ii) 11111101 8

2. *(a)* An output program resides in memory starting from address 2300. It is executed after the computer recognizes an interrupt when FGO becomes a 1(while IEN = 1) :

(i) What instruction must be placed at address 1?

(ii) What must be the last two instructions of the output program? 8

(b) Design a digital circuit that performs the four logic operations, exclusive-OR, exclusive-NOR, NOR and NAND. Use two selection variables. 7

UNIT—II

3. *(a)* Show how a 9-bit microoperation field in a microinstruction can be divided into subfields to specify 46 microoperations. How many microoperations can be specified in one microinstruction? 8

(b) Explain the differences between hardwind control and microprogrammed control. Is it possible to have a hardwind control associated with a control memory? 7

4. *(a)* Convert the following arithmetic expressions from infix to reverse Polish notation : 8

(i) A + B + C   D + E   F

(ii) A   B + A   (B   D + C   E)

(iii) A + B   [C   D + E   (F + G)]

(iv) $\dfrac{A \quad [B \quad C \quad (D \quad E)]}{F \quad (G \quad H)}$

(b) Convert the following numerical arithmetic expression into reverse Polish notation and show the stack operations for evaluating the numerical result : 7

(3   4)[10(2   6)   8]

UNIT—III

5. *(a)* Give the flowchart for the non-restoring method of fixed point binary division. 8

(b) Design an array multiplier that multiplies two 4-bit numbers. Use AND gates and binary adders. 7

6. *(a)* Draw the circuit to be used for the addition and subtraction of two decimal numbers in signed-magnitude representation. Indicate how an overflow is detected. 8

(b) Show that there can be no mantissa overflow after a multiplication operation. 7

UNIT—IV

7. *(a)* A virtual memory has a page size of 1K words. There are eight pages and four blocks. The associative memory page table contains the following entries :

Page	*Block*
0	3
1	1
4	2
6	0

Make a list of all virtual addresses (in decimal) that will cause a page fault if used by the CPU. 8

(b) An address space is specified by 24 bits and the corresponding memory space by 16 bits :

(i) How many words are there in the address space?

(ii) How many words are there in the memory space?

(iii) If a page consists of 2K words, how many pages and blocks are there in the system? 7

8. Explain the memory hierarchy. 15

UNIT—V

9. *(a)* Why are the read and write control lines in a DMA controller bidirectional? Under what condition and for what purpose are they used as inputs and outputs? 10

(b) Write short notes on the following : 5

(i) Daisy-chaining interrupt

(ii) DMA transfer

10. *(a)* Why does DMA have priority over the CPU, when both request a memory transfer? 5

(b) Discuss the process of handshaking. 10

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