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## Third Semester B.E. Degree Examination, Jan./Feb. 2023 Computer Organization

3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. With a neat diagram, analyze the basic operational concepts of a computer. Give the operating steps. (10 Marks)
- b. Explain Big Endian and little Endian assignment. Consider a computer that has a byte addressable memory organized in 32 WORDS, according to a Big Endian scheme. A program reads ASCII characters entered at a keyboard and store them in successive byte location starting at 3000. Show how the contents of 3 memory words at location 3000, 3004 and 3008 after the string "VTU BELAGAVI" has been entered.  
(ASCII codes : V = 56H, T = 54H, U = 55H, " " = 20H, B = 42H, E = 45H, L = 4CH, A = 41H, G = 47H, I = 49H) (10 Marks)

OR

- 2 a. Define an addressing mode. Explain any 4 types of addressing modes with suitable example. (10 Marks)
- b. Register R<sub>1</sub> and R<sub>2</sub> of computer contains the decimal values 1200 and 4600. What is effective address of the memory operand in each of following instructions :
- (i) LOAD 20(R<sub>1</sub>), R<sub>5</sub>
  - (ii) MOVE #3000, R<sub>5</sub>
  - (iii) SUBTRACT (R<sub>1</sub>)+, R<sub>5</sub>
  - (iv) STORE 30(R<sub>1</sub>, R<sub>2</sub>), R<sub>5</sub>
  - (v) ADD -(R<sub>2</sub>), R<sub>5</sub>
- (05 Marks)
- c. Explain logical shift instructions with examples. (05 Marks)

### Module-2

- 3 a. List the difference between memory mapped I/O and I/O mapped I/O. (04 Marks)
- b. With neat sketches, explain various methods for handling multiple interrupts requests raised by multiple devices. (08 Marks)
- c. With neat diagram, explain centralized bus arbitration and distributed bus arbitration. (08 Marks)

OR

- 4 a. Explain the I/O interface for an input device to the processor with a neat block diagram. (08 Marks)
- b. With neat diagram, explain synchronous bus transfer during an input operation. (06 Marks)
- c. Explain the tree structure of USB with split bus operation. (06 Marks)

### Module-3

- 5 a. Explain the organization of 1K\*1 memory chip. (06 Marks)
- b. With neat diagram, explain the internal organization of 2M\*8 dynamic memory chip. (10 Marks)
- c. Explain the memory hierarchy with respect to speed, size and cost. (04 Marks)

OR

- 6 a. Design a memory organization of  $2M \times 32$  memory module using  $512K \times 8$  static memory chips and explain the same. (08 Marks)
- b. Illustrate the cache mapping techniques. (06 Marks)
- c. Calculate the average access time experienced by a processor, if cache hit rate is 0.88, Miss penalty is 0.015 ms and cache access time 10 ms? (06 Marks)

**Module-4**

- 7 a. Convert the following pairs of decimal numbers to 5 bit, signed 2's complement, binary numbers and add them. State whether or not overflow occurs in each case :  
 (i) 6, 10      (ii) -3, -8      (iii) -10, -13      (iv) -14, 11      (10 Marks)
- b. Describe the principle of carry-look Ahead addition for 4-bit adder circuit, built using B-cells and calculate the number of gate delays for  $S_3$  and  $C_4$ . (10 Marks)

OR

- 8 a. Explain Booth multiplication algorithm. Apply the same to multiply signed number -13 and 9. (08 Marks)
- b. Perform the division of numbers 8 by 3 ( $8 \div 3$ ) using Restoring Division Method. (08 Marks)
- c. Design a logic circuit to perform addition / subtraction of  $2n$ -bit numbers X and Y. (04 Marks)

**Module-5**

- 9 a. Illustrate the sequence of operations required to execute the instruction ADD ( $R_3$ ),  $R_1$  on a single Bus processor. (10 Marks)
- b. Explain the 3 Bus organization of a data path with a neat diagram. (10 Marks)
- 10 a. With neat diagram, explain the microprogrammed control method for design of control unit and write the micro-routine for instruction BRANCH  $< 0$ . (10 Marks)
- b. Bring out the difference between micro programmed and Hard wired control. (04 Marks)
- c. With neat diagram, explain 4-stage pipeline. (06 Marks)

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