

[This question paper contains 4 printed pages.]

**For Visually handicapped Students only**

**Sr. No. of Question Paper : 1775 GC-3 Your Roll No.....**

Unique Paper Code : 32341102

Name of the Paper : C-2 Computer Systems Architecture

Name of the Course : **B.Sc. (H) Computer Science**

Semester : I

Duration : 3 Hours

Maximum Marks : 75

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **all** questions from **Section A**.
3. Attempt any **four** questions from **Section B**.
4. Attempt **all** parts of a question together.

**SECTION – A**

1. (a) A digital computer has a common bus system for 16 registers of 32 bits each. The bus is constructed with multiplexers.
  - (i) How many selection inputs are there in each multiplexer ?
  - (ii) How many multiplexers are there in the bus ? (5)
- (b) What is a flip flop ? Give the drawback of SR flip flop and how is it removed in JK flip flop ? Give the excitation table of D flip flop. (5)
- (c) Perform the arithmetic operations  $(+35) + (-17)$  and  $(-35) - (-17)$  in binary using 2's Complement representation for negative numbers. (5)

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- (d) Give mapping procedure that provides eight consecutive microinstructions for each machine instruction routine. The operation code has six bits and the control memory has 2048 words. (5)
- (e) Why are addressing modes required ? Explain indexed addressing mode and give its advantages. (5)
- (f) What is the role of FGI and FGO flip-flop in basic computer ? (5)
- (g) Explain the functioning of Direct memory access (DMA) I/O operation. (5)

### SECTION – B

2. (a) (i) Why is I/O module required between peripheral device and system bus ?
- (ii) Give two instructions required to set E=1 in basic computer. (3+2)

- (b) Write the program to evaluate the arithmetic statement

$$X = A - B + C \times (D \times E - F)$$

Using a stack organized computer with zero address instruction. (5)

3. (a) (i) Differentiate between hardwired and micro-programmed control unit. (3+2)
- (ii) Explain the operation STA and LDA instruction of basic computer.
- (b) Explain property of locality of reference. Also relate it to Hit-ratio. (5)

4. (a) What do you mean by instruction set completeness ? What are the different types of instructions that make the instruction set complete ? (5)
- (b) A two-word instruction is stored in memory at an address designated by the symbol W. The address field of the instruction stored at W+1 is designated by the symbol Y. The operand used during the execution of the instruction is stored at an address symbolized by Z. An index register contains the value X. State how Z is calculated from the other addresses if the addressing mode of the instruction is
- (i) direct
  - (ii) indirect
  - (iii) relative
  - (iv) indexed
  - (v) immediate (5)
5. (a) Differentiate between combinational circuit and sequential circuit. Give example of each ? (5)
- (b) Convert following infix expressions into postfix expressions :
- (i)  $A + B * [C * D + E * (F + G)]$
  - (ii)  $A * B + A * (B * D + C * E)$  (5)
6. (a) Discuss the major difficulties of instruction pipeline. (5)
- (b) A non-pipeline system takes 50 ns to process a task. The same task can be processed in a six-segment pipeline with a clock cycle of 10 ns. Determine the speed-up ratio of the pipeline for 100 tasks. What is the maximum achievable speed-up ? (5)

7. (a) Write a short note on associative memory. (5)
- (b) Show the step-by-step multiplication process using Booth algorithm for the following numbers in binary :  $(+11) \times (-13)$ . (5)