

END SEMESTER EXAMINATION : NOV.-DEC., 2016

**COMPUTER ORGANIZATION
AND ARCHITECTURE**

Time : 3 Hrs.

Maximum Marks : 70

Note: *Attempt questions from all sections as directed.*

SECTION – A (30 Marks)

Attempt any five questions out of six.

Each question carries 06 marks.

1. A digital computer has a common bus system for 16 registers of 32 bits each. The bus is constructed with Multiplexers.
 - (a) How many selection inputs are needed for each MUX ? (2)
 - (b) What size of multiplexers are needed ? (2)
 - (c) How many multiplexers are there in the bus ? (2)
2. Draw a space time diagram for four-segment pipeline showing the time it takes to process each task.

P.T.O.

3. Design a digital circuit that perform four logic operations of exclusive-OR, exclusive-NOR, NOR and NAND. Use two selection variables. Show logic diagram of one typical stage ?
4. Draw flowchart for instruction cycle of computer and explain.
5. What are various addressing modes ? Explain any five with help of suitable example.
6. (a) Distinguish control memory and main memory used in digital computer. Why control memory is necessary ? (3)
(b) Differentiate between Horizontal and Vertical microinstruction format for microprogrammed Control unit. (3)

SECTION – B (20 Marks)

Attempt any two questions out of three.

Each question carries 10 marks.

7. What is a cache memory ? Explain the various mapping techniques of cache memory.
8. (a) A computer employs RAM chips of 256×8 and ROM chips of 1024×8 . The computer system

needs 2K bytes of RAM, 4K bytes of ROM, and four interface units, each with four registers. A memory-mapped I/Configuration is used. The two highest-order bits of the address bus are assigned 00 for RAM, 01 for ROM, 10 for interface registers.

(i) How many RAM and ROM chips are needed ?

(ii) Draw a memory-address map for the system.

(iii) Give the address range in hexadecimal for RAM, ROM, and interface. (8)

(b) Convert the following arithmetic expression from infix to reverse polish notation.

(i) $A * B + C * D$

(ii) $A * (B * D + C * E)$ (2)

9. (a) Explain two ways for establishing priority of interrupt by multiple devices. (5)

(b) Explain DMA transfer in detail with the help of diagram. (5)

SECTION – C

(20 Marks)

(Compulsory)

10. (a) Write a program to evaluate the arithmetic statement :

$$X = A * (B + C) + D / E * F + G$$

1. Using a general register computer with three-operand instructions
2. Using a general register computer with two-operand instructions
3. Using an accumulator type computer with one-operand instructions
4. Using a stack organized computer with zero address instructions (stack instructions)

Do not modify the values of A, B, C, D, E, F or G. Use a temporary location T to store the intermediate results if is necessary. (10)

- (b) Explain various types of logical operations available. Starting from an initial value of $R = 1101\ 1101$, determine the sequence of binary values in R after each operation in the sequence : (1) a logical shift-left, (2) followed by an arithmetic shift-right, (3) followed by another arithmetic shift-right, and (4) followed, finally, by a circular shift-left. Show all your work.

Repeat the same for the $R = 0011\ 1100$. (10)

(900)