

$$ab' + (a' + b')$$

$$+ ab' + a'b'$$

IC1612

M.Sc. (INFORMATICS) / 1<sup>st</sup> Semester 2016

Paper IT12 – COMPUTER ARCHITECTURE

Time: 3 hrs.

Attempt any 5 questions.

Max Marks: 75

Question No.1 is compulsory.

(Write your Roll No. on the top immediately on receipt of this question paper)

1. Each part carries 3 marks.

a. Define the following terms:

- Auxiliary Memory
- Excitation Table
- Pseudo Instruction

b. Draw a timing diagram assuming that SC is cleared to 0 at time  $T_3$  if control signal  $C_7$  is active.

$$C_7 T_3: SC \leftarrow 0$$

$C_7$  is activated with the positive clock transition associated with  $T_1$

c. Explain the different mapping procedures considering the organization of cache memory.

d. What is the radix of the numbers if the solution to the quadratic equation  $x^2 - 10x + 36 = 0$  is  $x = 6$  and  $x = 8$ ?

e. A digital computer has a common bus system for 32 registers of 16 bits each. The bus is constructed with multiplexers.

- How many selection inputs are there in each multiplexer?
- What size of multiplexers are needed?
- How many multiplexers are there in the bus?

2.

a. Given the Boolean function:

(5)

$$F(x, y, z) = xy'z + x'y'z + x'yz$$

- List the truth table of the function
- Draw the logic diagram using the original Boolean expression
- Simplify the algebraic expression using Boolean algebra

- iv. List the truth table of the function from the simplified expression and show that it is the same as the truth table in part (i)
  - v. Draw the logic diagram from the simplified expression and compare the total number of gates with the diagram of part (ii)
- b. What is the difference between serial and parallel transfer? Using a shift register with parallel load, explain how to convert serial input data to parallel output and parallel input data to serial output (4)
- c. Write a symbolic program (using loops) to add 200 numbers (6)

3.

- a. Explain the working principles of Associative memory? (5)
- b. Determine by means of a truth table the validity of DeMorgan's theorem for six variables:  $(ABCDEF)' = A' + B' + C' + D' + E' + F'$  (3)✓
- c. Design an Accumulator Logic for a basic computer detailing on the Control logic for AC register. (Refer the Control functions and Micro-operations for the basic computer give at the end) (7)

4.

- a. List the assembly language program generated by a compiler for the following IF statement:

$IF (A - B) 10, 20, 30$

The program branches to statement 10 if  $A - B < 0$ ; to statement 20 if  $A - B = 0$ ; and to statement 30 if  $A - B > 0$  (5)

- b. Formulate a mapping procedure that provides eight consecutive microinstructions for each routine. The operation code has six bits and the control memory has 2048 words. (5)
- c. Explain with the help of a diagram the working of 8-bit combinational circuit shifter. (5)

5.

- a. Simplify the Boolean function  $F$  together with don't care conditions  $d$  in
  - i. Sum-of-products form ✓
  - ii. Product-of-sums form (4)

$$F(v, w, x, y, z) = \sum (0, 1, 2, 3, 7, 8, 10, 13, 18, 24, 25, 29)$$

$$d(v, w, x, y, z) = \sum (4, 5, 6, 11, 15, 17, 21, 30)$$

- 6.

- b. Represent decimal number 8620 in: (4) —

- c. Explain with example how we can perform the following operations on bits using logic micro-operations? (3)

- i. selective set
- ii. selective complement
- iii. selective clear

- d. Write a subroutine to complement each word in a block of data. In the calling program, the BSA instruction is followed by two parameters: the starting address of the block and the number of words in the block. (4)

Handwritten calculations for the number 1077:

1077  
86201  
8  
062  
56

38  
2

38  
2

38  
2

76

8616

2<sup>10</sup> = 1024

2<sup>10</sup> × 2<sup>3</sup> = 8

250  
19  
269

538  
134

8 | 1077

8 | 134

8 | 1077