

This question paper contains 4+1 printed pages]

Your Roll No. ....

231

B.Sc. (Prog.)/II

C

COMPUTER SCIENCE

Paper--CS-202-Computer System Architecture

(Admissions of 2005 and onwards)

Time : Three Hours

Maximum Marks : 75

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

All questions are compulsory. Marks are indicated

against each question. All parts of a question

must be done together.

1. (a) Simplify the following Boolean function using four variable

Karnaugh Map :

5

$$F(w, x, y, z) = \sum(3, 7, 11, 13, 14, 15)$$

- (b) Show how a JK flip-flop can be converted to : 4

(i) T flip-flop

(ii) D flip-flop.

P.T.O.

- (c) Design a sequential circuit for a two bit count down counter with 2 JK flip-flops and 1 binary input  $x$ . When  $x = 0$  the state of the flip-flops does not change. When  $x = 1$  the state sequences is 11, 10, 01, 00, 11 and so on. 6
2. (a) Draw a diagram for bus system for 4 registers each of size 4 bits. 6
- (b) What is a binary counter ? Draw a 4 bit synchronous binary counter using JK flip-flops. Explain its working. 7
- (c) Differentiate between multiplexer and decoder. 2
3. (a) Convert the following numbers to the indicated base : 4
- (i)  $(10101.010)_2$  to  $(- -)_{10}$
- (ii)  $(6834)_{10}$  to  $(- -)_{16}$
- (iii)  $(56.50)_{10}$  to  $(- -)_8$
- (iv)  $(C1A2)_{16}$  to  $(- -)_2$

- (b) Show the hardware including logic gates for the control function that implements the statement : 4

$$xy' T_0 + T_1 + x'y T_2 : A \leftarrow A + 1$$

- (c) Perform arithmetic operation in binary using signed 2's complement representation for negative numbers :

(i)  $(+42) + (-23)$

(ii)  $(-42) - (-23)$ . 4

- (d) Represent the number  $(+54.5)_{10}$  as a floating point binary number with 24 bits. The normalized fraction mantissa has 16 bits and exponent has 8 bits. 3

4. (a) Instructions of a computer with memory capacity of 2 K words contain a 7 bit op-code, 2 bit processor register code, address of a memory operand, address of next instruction and a direct/indirect mode bit :

- (i) How many bits must be in a word if an instruction is stored in one word ?

- (ii) Show the instruction word format indicating the number of bits and functions of each part.
- (iii) What is the maximum no. of operations that can be incorporated in the computer ? 6
- (b) An instruction at memory address  $(01F)_{16}$  has a mode bit  $1 = 1$ , an operation code of BSA instruction, an address part  $(083)_{16}$ . The memory word at address  $(083)_{16}$  contains  $(B8F_2)_{16}$  and the contents of AC are  $(a937)_{16}$ . Write the fetch indirect and execute cycles and determine the contents of PC, Memory Address Register (MAR), data register (DR), AC and memory word  $(B8F2)_{16}$  after the instruction at  $(01F)_{16}$  is fetched and executed. What should be the last instruction of the subroutine and why ? 9

5. (a) Write the set of instructions to evaluate the arithmetic statement :

$$X = (A + B) * (C + D)$$

- (i) Using general register computer with three address instructions
- (ii) Using general register computer with two address instructions
- (iii) Using accumulator type computer with one address instructions. 6

- (b) Write short notes on any *three* :

- (i) Direct Memory Access
- (ii) Priority Interrupt
- (iii) Programmed I/O
- (iv) RISC
- (v) I/O interfaces. 9