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No. of Printed Pages—4 CS–401

B. TECH.

FOURTH SEMESTER EXAMINATION, 2003–2004

COMPUTER ORGANIZATION

Time : 3 Hours *Total Marks : 100*

Note : (1) Attempt **ALL** questions.

(2) All questions carry equal marks.

1. Attempt any FOUR of the following :— **(5×4=20)**

(*a*) Find the decimal equivalent of the following :—

(*i*) $(134\cdot2)_5$

(*ii*) $(1212\cdot2)_3$

(*iii*) $(AAB\cdot A)_{16}$

(*iv*) $(346\cdot6)_8$

(*v*) $(101011\cdot1)_2$

(*b*) Perform the following operations using 2's complement arithmetic :—

(*i*) $(80)_{10}+(20)_{10}$

(*ii*) $(-60)_{10}+(-30)_{10}$

(*c*) Draw Karnaugh's map of the following functions and simplify :—

(*i*) $F(A,B,C,D)=\Sigma(0,2,4,6,8,10,11,12,14,15)$

(*ii*) $F(A,B,C,D)=\Sigma(2,3,6,7,14,15)$

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(*d*) What do you mean by BCD and XS–3 codes ? Explain. Perform the following operations using XS–3 code :—

(*i*) $(234)_{10} + (148)_{10}$

(*ii*) $(88)_{10} - (43)_{10}$

(*e*) What is Hamming Code ? Explain with example.

(*f*) What are ASCII and EBCD/C Codes ? Explain.

2. Attempt any FOUR of the following :— (5×4=20)

(*a*) Draw the logic diagram of JK master slave flip-flop and explain its operation.

(*b*) What is Shift Register ? Explain the operation with block diagram.

(*c*) What are Multiplexers and Demultiplexers ? Explain the working of any one by drawing logic diagram.

(*d*) Explain the operation of 4-bit synchronous binary counter.

(*e*) Draw the internal block diagram of CPU. Explain its various components in brief.

(*f*) Explain micro-instruction format. Describe horizontal and vertical micro-instructions.

3. Attempt any TWO of the following :— (10×2=20)

(*a*) Find the expression for generation of carry-in four-bit carry-look ahead adder. Also draw its logic diagram.

(*b*) What are the basic differences between Interrupt initiated I/O and Programmed I/O ? Explain in detail.

(c) Derive a combinational circuit that selects and generates any of the following 8 logic functions :—

Operation Select			Output	micro-operation
S_1	S_0	C_{in}		
0	0	0	A+B	Add
0	0	1	A+B+1	Add with carry
0	1	0	$A+\overline{B}$	Subtract with borrow
0	1	1	A–B	Subtract
1	0	0	A	Transfer A
1	0	1	A+1	Increment A
1	1	0	A–1	Decrement A
1	1	1	A	Transfer A

4. Attempt any TWO of the following :— **(10×2=20)**

(a) Assume that memory locations A, B, C, D, E, F, G and δ should not be changed. Write a program for simple three address and zero address machines to perform

$$\delta = (A + B - C)/(D * (5 * F - G))$$

Temporary cell T_1, T_2 may be used.

(b) Discuss the DMA data transfer with the help of block diagram.

(c) Describe the principle of designing Instruction Set of a processor. Explain the important fields of instruction format.

5. Attempt any TWO of the following :— **(10×2=20)**

(a) Describe the Flynn's classification of various computer architectures.

(b) Consider a Cache (M_1) and Memory (M_2) hierarchy with following characteristics :—

M_1 : 16 K word, 50 ns Access time

M_2 : 1 M word, 400 ns Access time

Assume 8–word cache blocks and set size 256 words with set associative mapping.

(*i*) Show and explain the mapping between M_2 and M_1.

(*ii*) Calculate the effective memory access time with cache hit ratio = 0·95.

(*c*) Discuss the architectural difference between Shared memory multiprocessors and Distributed memory multiprocessors. Also comment about their performance in different program environment.