Question Paper

MANIPAL UNIVERSITY

SCHOOL OF INFORMATION SCIENCES
SECOND SEMESTER MSc INFORMATION SCIENCE
DEGREE MAKE - UP EXAMINATION - JULY 2017
Friday, 14 July, 2017
Time: 10:00 to 13:00

Computer Architecture - Elective 1 [MIS 510.2]

Marks: 100 **Duration: 180 mins.**

Answer all the questions.

All questions carry equal marks

1) Explain with a block diagram a Accumulator based machine (10)

2) In a computer instruction format, the instruction length & size of the address field are 11 & 4 respectively. If the number of 2 address instructions are 5, calculate the possible combinations of one & zero address instructions. (10)

3) The instruction set of a computer consists of six (6) instructions I_0, I_1, â€¦I_5. The relative frequency of these instructions are as follows (10)
(6+2+2) marks

I_0	I_1	I_2	I_3	I_4	I_5
1/2	1/4	1/16	1/16	1/16	1/16

a) Encode these instructions using Huffman's method
b) Calculate the total number of bits saved compared to block encoding method
c) Calculate the average number of bits per instruction.

4) (a) Design a combinational circuit with 3 inputs & one output. The output is "1" when (10)

the input binary value is less than 5 & is "0" otherwise. (5 marks)

(b) Design a combinational circuit for the following specifications:Y = 1, if A is 1 or B and C are 1, Z= 1, if B or C is 1 but not both. (5 marks)

5) Write a circuit of a 4 bit two input Carry look ahead Adder (CLA) and compare its execution speed with 4 bit two input Carry Propagate Adder. (10)

6) Design a four bit two input ALU unit to implement ADD, SUB, NOT & NAND functions. (10)

7) Design a microprogrammed control unit to multiply two 4 bit numbers using Booth's multiplier. (10)

8) Explain (a) Direct (b) Fully Associative mapping policies with suitable block diagram. Compare the advantages and disadvantages of both (4+4+2) marks (10)

9) Assume a main memory has 3 page frames and initially all page frames are empty. Consider the following stream of references (10)

2,3,2,4,6,2,5,6,1,4,6

Calculate the hit ratio if the replacement policy used is
FIFO (b) LRU (c) Optimal replacement policy. (3+3+4) marks

10) The size of the virtual address space = 8 k words (10)
Size of the physical address space = 2k words.

Page size = 512 words

The page request sequence is:

0,1,2,3,5,6,3,4,7,2,6,5.

a. Calculate the number of physical & virtual pages (2 marks)
b. Calculate value of "h" for the above sequence in case of Direct mapping
(4 marks)
c. Find all the virtual addresses that generate page fault after the end of the above sequence. (4 marks)