NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHAETRA
THEORY EXAMINATION
Question Paper

Month and Year of Examination: Nov.-Dec. 2021
Programme: B. Tech Semester: III[rd]
Subject: Computer Organization and Architecture
Course No: ITPC 29 Maximum Marks:50
Number of Questions to be attempted: 05 Time Allowed: 2 hrs
Total no. of Questions: 06 Total No of Pages Used: 03

Q1. (a) How many additions/Subtractions are required for the multiplication of the 5 (Multiplicand) and -30 (Multiplier) using Booth algorithm? Explain your answer.

(5 marks)

(b) Minimize the following function in SOP minimal form using K-Maps:

F(A, B, C, D) = m(1, 2, 6, 7, 8, 13, 14, 15) + d(3, 5, 12) (5 marks)

Q2. (a) Draw a space time diagram for six segment pipeline showing the time it takes to process eight tasks. (5 marks)

(b) A non pipeline system takes 50ns to process a task. The same task can be processed in a six segment pipeline with a clock cycle of 10 ns. Determine the speedup ratio of the pipeline for 100 tasks. What is maximum speed up ratio. Explain (5 marks)

Q3.(a) A relative mode branch type of instruction is stored in memory at an address equivalent to decimal 750. The branch is made to an address equivalent to decimal 500.

i. What should be the value of the relative address field of the instruction (in decimal).

ii. Determine the relative address value in binary using 12 bits. (Why must the number be in 2's complement?)

iii. Determine the binary value in PC after fetch phase and calculate binary value of 500. Then show that the binary value in PC plus the relative address calculated in part (b) is equal to the binary value of 500. (6 marks)

(b) How many times does the control unit refer to memory when it fetches and executes an indirect addressing mode instruction if instruction is (a) a computational type requiring an operand from memory (b) a branch type.

(4 marks)

Q4. (a) A virtual memory has a page size of 1K words. There are eight pages and four blocks. The associative memory page table contains the following entries. Make a list of all virtual address (in decimal) that will cause a page fault if used by the CPU. (6 marks)

Page	Block
0	3
1	1
4	2
6	0

Q4 (b) The logical space in a computer system of 128 segments. Each segment can have up to 32 pages of 4 K words in each. Physical memory consists of 4K blocks of 4K words in each. Formulate the logical and physical address space (4 marks)

Q5. (a) Why does DMA have priority over CPU when both request a memory transfer? (5 marks)

(b) Why are the read and write control lines in a DMA controller bidirectional? Under what condition and for what purpose are they used as inputs? Under what condition and for what purpose are they used as inputs? (5 marks)

Q6. (a) What is difference between isolated and memory mapped I/O? What are advantages and disadvantages of each? (4 marks)

(b) A two-word instruction is stored in memory at an address designated by the symbol W. The address field of the instruction (stored at W + 1) is designated by the symbol Y. The operand used during the execution of the instruction is stored at an address symbolized by Z. An index register contains the value X. State

how Z is calculated from the other addresses if the addressing mode of the instruction is (i) Direct (ii) Indirect (iii) Relative (iv) Indexed (6 marks)

Incase of any discrepancy please contact Dr. Priyanka ahlawat
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