

ALCCS – OLD SCHEME

Time: 3 Hours

AUGUST 2013

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE:

- Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.
- Parts of a question should be answered at the same place.

- Q.1**
- a. Mention any four optimization criteria used in digital systems.
 - b. Implement Full-adder Circuit with the help of decoder and OR gates.
 - c. What do you mean by locality of reference?
 - d. How data is transmitted in synchronous serial communication system?
 - e. What do you mean by Memory – interleaving?
 - f. Distinguish between horizontal and vertical microinstruction.
 - g. Explain Maskable and Non-maskable interrupt. (7×4)
- Q.2**
- a. Implement 4-to-16 line decoder using 3-to-8 decoders. (4)
 - b. For an array multiplier circuit that multiplies two unsigned four-bit numbers, calculate the following:
 - (i) How many AND gates are required?
 - (ii) How many adders and of what size is required?
 - (iii) How many bits are there in final product? (6)
 - c. Explain Restoring division and Non-restoring division process. Also, give algorithms for the two processes. (8)
- Q.3**
- a. A bus-organized CPU has 16 registers with 32 bits in each, an ALU, and a destination decoder.
 - (i) How many multiplexers are there in the bus, and what is the size of each multiplexer?
 - (ii) How many selection inputs are needed for MUX?
 - (iii) How many inputs and outputs are there in the decoder?
 - (iv) How many inputs and outputs are there in the ALU for data, including input and output carries?

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- (v) Formulate a control word for the system assuming that the ALU has 35 operations? (10)
- b. What is Assembly language? What are the kinds of statements used in Assembly Language Program? Give advantages and disadvantages of assembly language? (8)
- Q.4** a. Compare RISC and CISC instructions. Give their respective advantages and disadvantages. (6)
- b. Give an example to illustrate zero-address, one-address and two-address instructions. (6)
- c. Explain the role of symbolic microprogram and binary microprogram in microprogrammed control. (6)
- Q.5** a. The access time of a cache memory is 50 ns and that of the main memory is 500 ns. It is estimated that 80% of the main memory requests are for read operation and the remaining are for write. The hit ratio for read access only is 0.9 and a write through policy is used.
- (i) What is the average access time of the system considering only memory read cycles?
- (ii) What is the average access time of the system for both read and write requests?
- (iii) What is the hit ratio taking into consideration the write cycle? (6)
- b. Explain the need of memory hierarchy with the help of a block diagram? What is the reason for not having one large memory unit for storing all information at one place? (6)
- c. Why page-table is required in a virtual memory system. Explain different ways of organizing a page table. (6)
- Q.6** a. The 8-bit registers A, B, C & D are loaded with the value (F2)_H, (FF)_H, (B9)_H and (EA)_H respectively. Determine the register content after the execution of the following sequence of micro-operations sequentially.
- (i) $A \leftarrow A + B$, $C \leftarrow C + \text{shl}(D)$
- (ii) $C \leftarrow C \wedge D$, $B \leftarrow B + 1$
- (iii) $A \leftarrow A - C$
- (iv) $A \leftarrow \text{shr}(B) \oplus \text{cir}(D)$ (10)
- b. With the help of neat block diagram explain the function of a Microprogram Sequencer? (8)
- Q.7** a. What is Priority interrupt? Discuss Daisy-Chaining Priority in details with the help of diagram. (8)

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- b. How many characters per second can be transmitted over a 1200 baud line in asynchronous serial transmission in following modes – assume a character code is of eight bits?
- (i) Synchronous Serial transfer
 - (ii) Asynchronous Serial Transfer with 2 stop bits
 - (iii) Asynchronous Serial Transfer with one stop bit **(6)**
- c. Compare I/O mapped and memory mapped I/O. Give their applications. **(4)**