THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

038

ECD 1210 / ECE 3210 – Introduction to Computer Technology

Final Examination – 2003 / 2004 *(Closed Book Type)*

Date : Tuesday, 28th of March, 2006 Time : 09:30 – 12:30

INSTRUCTIONS TO CANDIDATES

You must answer both questions in Part A. And other two from Part B. Questions in Part A carry 30 marks each and questions in Part B carry 20 marks each.

Part A

1. Show all steps of conversions and calculations for the following. (Marks will not be give if steps are not shown). [30 marks]

(a) Convert the following to decimal (base 10). [per 2 marks = 8]

(i) $1001\ 1100_2$ (ii) 336_8

(iii) $F9_{12}$ (iv) 150_{16}

(b) Convert the following to binary (base 2). [per 2 marks = 8]

(i) 74_8 (ii) 87_{10}

(iii) $B3_{12}$ (iv) DC_{16}

(c) Do the following additions in binary. [per 3 marks = 6]

(i) $9A_{16} + 74_8$ (ii) $283_{10} + 5A_{12}$

(d) Do the following subtractions using 2's complement. Note the final answer must be in a binary form. [per 4 marks = 8]

(i) $-61_{12} + 49_{10}$ (ii) $-57_{16} - 72_8$

2. A new dam constructed across one of the larger rivers in Sri Lanka will have gates to control amount of water passed down the stream. The gates will be opened and closed by an operator by means of pressing "gate open" and "gate close" buttons. Your task is to design microcontroller system which will show the operator to which percentage the gates have been opened. All gates open simultaneously. When a gate is closed the display should indicate "0"; and when the gates are fully open it will indicate "100". Sometimes the operators have to open the gates partially, so the display should provide them with adequate reading.

(a) Explain what kind of chips you will need for this project. [10 marks]

(b) Draw a functional block diagram of your system. [8 marks]

(c) Draw the complete microprocessor system. [12 marks]

(Hint: use the same method explained in "What Every Engineer Should Know About Microcomputers" by William S. Bennett and Carl F. Evert, Jr.)

Part B

3. Two of your friends, Michael and John ask you to assemble a computer for them. Michael needs it for his business to keep track of his invoices. And John needs one for his advertising agency. Both would like to get a computer as cheep as possible. For both orders answer the following questions separately.

(i) What are the essential parts you need? [6 marks]

(ii) Why have you made such a choice? Explain briefly. [8 marks]

(iii) What organization method you will follow when assembling these computers? Describe. [6 marks]

4. (a) Consider you are going to design and develop an Information System for Construction Corporation. This corporation would like to use Information System to keep track of its contracts and employees. It should also contain all the information of each client, employee, equipment and construction materials.

Design Database File Systems of

(i) client [3 marks]

(ii) employee [3 marks]

(iii) equipment [3 marks]

(iv) construction materials [3 marks]

(b) The above mentioned Construction Corporation would like to network all of its offices and construction sights.

(i) Draw the network of your system. [4 marks]

(ii) Described the networking system used. [4 marks]

5. (a) Draw a hypothetical microprocessor and clearly show all connection between the elements. [7 marks]

(b) Briefly describe the elements of hypothetical microprocessor. [7 marks]

(c) Name all the registers available in your hypothetical microprocessor and explain what are they used for. [6 marks]

6. Assume you are asked to design a new high level application language that will be installed in the Open University. The language should handle all the needs of the University.

(a) What kind of tasks do you propose your application will handle? [5 marks]

(b) Describe its features. Why do you think they are important? [5 marks]

(c) Describe its interface. What kind of user do you have in mind? Why? [5 marks]

(d) State advantages and disadvantages of your language compared to others. [5 marks]