The Open University of Sri Lanka
Department of Electrical and Computer Engineering

ECX3233 - Communications & Information Technology

FINAL EXAMINATION 2015/16

Date: 27th November 2016 Time: 09.30 hrs – 12.30 hrs

Answer four questions including question 1. Write your answers clearly. Write all relevant intermediate steps when answering question 2.

1)

0	1	23	45	76	0	1	80	27	65	0	0	1	77	53	11	0	0	1000

Above figure shows the pattern of an array of integer numbers where;

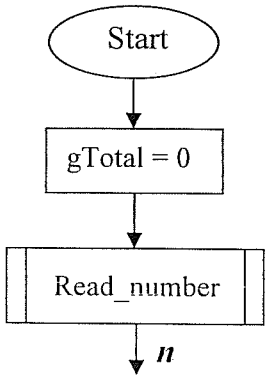
- each number is one of 0, 1 and X *(X is a two digit number between 10 & 99),*
- you get three consecutive Xs after each 1 only,
- array ends with the special number 1000,
- length of array is greater than 1.

Draw a flowchart to show the algorithmic logic to do the following tasks by processing the whole array:

i. Read numbers in the array one by one,
ii. Calculate the sub-total of Xs in each block (i.e. the sum of three numbers) and display it in the next step,
iii. Calculate the grand total (sum of above sub-totals) and display it at the last step of the algorithm.

Use the same set of flowchart symbols agreed when doing your TMAs.
Also use the variable identifiers *sTotal (for sub total), gTotal (for grand total)* as appropriate.
State all assumptions.

Hint: You may start with the steps shown in the following diagram and next construct a looping mechanism.



where the pre-processor *Read_number* reads a number from the array in sequence at each call and outputs it as ***n***.

(30 Marks)

b) Consider an ISA of a hypothetical microprocessor with an accumulator and two registers R1, R2. Assuming that R1< R2 according to their initial values, write a piece of assembly code to do the following task.

Task: To increment the value in R1 and to decrement the value in R2 until the values in R1 and R2 becomes equal.

You should start your code with incrementing R1.
Given the following set of instructions:

Instruction	**Description (Acc: Accumulator)**
MOV R_i	Moves register_content to Acc.
SUB R_i	Subtracts register_content from Acc_content
STO R_i	Writes Acc_content in to register
INC	Increments Acc_content
DEC	Decrements Acc_content
JMP label	Branching to given_label
JZ label	Branching to given_label, if Acc_content is zero
HLT	Halt the operation

(10 Marks)

2) Write all relevant intermediate steps when answering questions from (a) to (d)

a) Convert the following decimal integer and fraction to binary.

i. 74 *(01 Mark)*

ii. 0.201 (Truncate answer at 4th bit after binary point) *(02 Marks)*

b)

i. Calculate the decimal equivalent of 110011.01_2 *(02 Marks)*

ii. Calculate the value of m where $51_H = 1m4_8 - 10011_2$
where m denotes 2nd position of the octal number $1m4$ *(03 Marks)*

iii. Convert the octal number 6352 to its hexadecimal equivalent *(02 Marks)*

c) Perform the following binary arithmetic operations:

i. 101001 - 1110 *(02 Marks)*

ii. 1000001 ÷ 101 (perform long division) *(03 Marks)*

d) Perform -3-10 by using 2's complement technique. *(05 Marks)*

3)

a) By preparing a table, compare the two LAN technologies Ethernet and Token ring in terms of topology, access method, speed and cost.

(08 Marks)

b) Sketch how a PC is connected to an Ethernet hub in horizontal wiring. Label your sketch.

(05 Marks)

c) What is meant by URL in Web technology?
Comment on the case sensitivity of URL.
Give an example. *(03 Marks)*

d) "*Switches basically work at layer-2 of ISO/OSI model. However there are modern switches with extended features*".
Do you agree with this statement? Explain.

(04 Marks)

4)

a)

i. Explain the concept of virtual machine that the operating system provides as one of its main services to the user. *(03 Marks)*

ii. By considering a virtual machine, write four major characteristics (or components) that are much simpler for the user.

(04 Marks)

b)

i. Write what the input and the output of a compiler are. *(02 Marks)*

ii. Name four main phases of the compilation process. *(04 Marks)*

c) Write a piece of code in *Pascal* (or *C* language) to do the following:

- To define a 1-D array ***arr*** to represent ten(10) ASCII characters (of preliminary data type),
- Assign the character '***c***' as the value of each element of the array.

(07 Marks)

5)

a)

i. Draw the amplitude, frequency and phase modulated waveforms for a sinusoidal carrier C (t) = sin 200000πt and a digital information signal x (t) given as in Figure Q5. *(3x02Marks)*

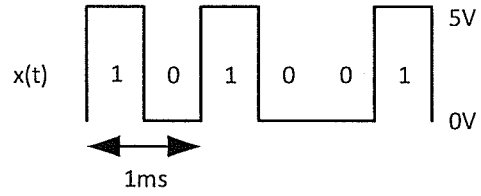


Figure Q5

ii. Using suitable diagrams explain the importance of modulation index in amplitude modulation. *(03 Marks)*

b)

i. List four different types of wired communication media and compare them in terms of bandwidth and immunity to interference. *(4x01Mark)*

ii. A certain communication link consists of a transmitter, receiver and a repeater placed in a straight line. Let the repeater lie exactly at the mid-point between the transmitter and the receiver. Let the loss of the media be 12dB/km. Repeater gain is 10dB. If the transmit power is 1W and the receiver threshold is -20dBm, calculate the maximum distance between the transmitter and the receiver.

(05 Marks)

iii. Calculate the received power at the repeater input. *(02 Marks)*