The Open University of Sri Lanka
Diploma in Technology
ECX 3233 Communications & Information Technology
Final Examination 2005/2006

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Date : April 23rd, 2006 Time : 0930 – 1230 hrs.

This Question Paper consists of three parts (A, B, & C). Part A (Q1) is ***compulsory****, and carries 40 marks. Parts B and C consist of three questions each, and you are to answer any* ***two*** *questions from each Part, (15 marks each). Illegible answers will not be given marks. Please attach all parts of each question together.*

PART A *(compulsory)*

Q1. Read the following scenario carefully:

The SuperCo supermarket is to conduct an opinion poll to find out the popularity of soft-drinks they sell. There are five companies offering soft-drinks. They are *AgriCola, BubbleBrew, CoolCup, DevineDew*, and *ExoAqua*. Each company markets six flavours. They are *Cola, Citrus, Orange, Lime, Ginger*, and *Soda* respectively. Each company markets their flavoured drinks under different brand names. 2500 customers visiting the main (Union Place) branch on a single day are requested to take part in the poll on a voluntary basis. They are to select their favourite company. They also may, if they wish, vote for up to three of their favourite flavours. Anonymity for the participants is to be provided. The results of the poll – the favourite Company and three most popular flavours - are to be ready at the end of the day.

a) Draw a flowchart to describe an algorithm for the poll.

b) Describe the design for a suitable input interface.

c) Mention problems/complications you may face, and suggest possible solutions and improvements for the design.

d) The company wants to extend the poll to get a national-level opinion, so wants to conduct the poll in branches at Kandy, Matara, Anuradhapura, Negambo, Kurunegala, Trincomalee, Badulla, Ratnapura, Puttalam, and Jaffna. About 1000 customers are to be polled from at each branch, over a period of three days. Describe the changes and additions you would make to the original design.

You are to state any assumptions, simplification that you may use.

Hint : Think of the assignments

PART B

Q2. Perform following calculations. Show all relevant intermediate steps.

a) Convert 741.25_{10} to its binary equivalent.

b) Find **b** so that $572_b = 2AC_{16}$.

c) Perform the binary multiplication $10101.1_2 \times 1111_2$.

d) Perform the binary division $1011100_2 \div 1000_2$.

e) Subtract 3 from –4 using twos' complement representation.

Q3. a) Describe the von Neumann Computer Architecture.

b) Describe the function of System Software.

c) What is the difference between an Assembler and a Compiler?

d) Name the different phases of a compiler, and describe them briefly.

Q4. a) What are the advantages and disadvantage of networking computers within a company?

b) Describe main Network Topologies.

c) Describe the difference between LAN and WAN.

d) Describe the difference between Ethernet and Token-ring access methods.

e) What is the Internet? How dose it function?

PART C

Q5. (a) Explain the following statements, emphasizing the principle behind it:

(i) The gain of an amplifier is 40 dB.

(ii) Loss of a transmission line is 0.06 dB/km.

(iii) Received signal level is 4 dBm.

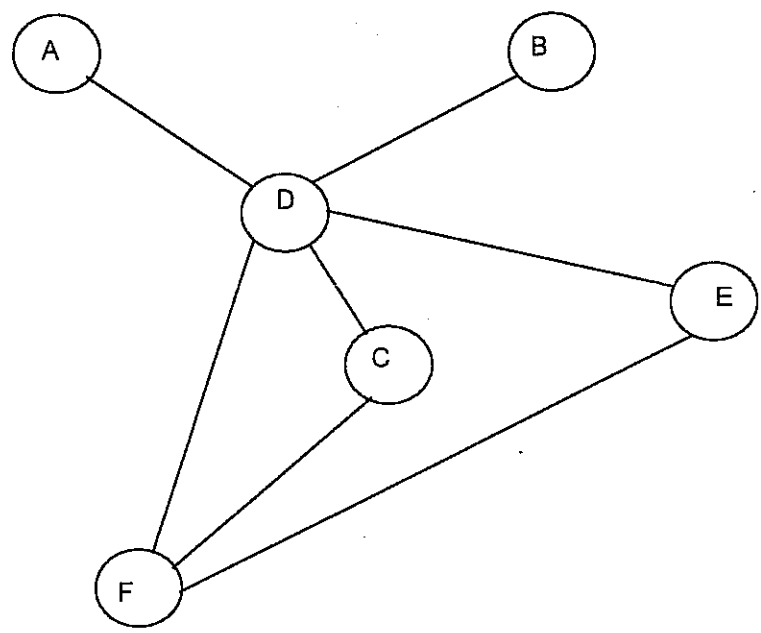

Fig.5

(b) A computer network consisting of 6 computers A, B, C, D, E and F are shown in Fig.5.

(i) It is necessary to select one computer as the server. Which computer would you suggest? Give justification(s) for your choice.

Lengths and the losses of different links are as follows:

Link	Length (m)	Cable loss (dB / km)
AD	300	0.03
DB	280	0.03
CD	150	0.03
FC	360	0.06
FE	500	0.06
ED	400	0.03
DF	380	0.06

(ii) A message is sent from D to E. If the signal level at the output of D is 10 dBm, find the receiving power level at E.

(iii) A message is to be sent from A to E.

(α) Suggest a suitable path. Justify your answer.

(β) Suggest the best alternative path. Justify your answer.

(Assume that the output level of any computer is the same)

Q6. (a) Variation of the field strength of a radio wave is given by $E = E_0\cos(88000t)$, where E_0 is a constant and t is the time.

(i) Does this signal possess audio information? Justify your answer.

(ii) Find the frequency of the signal.

(iii) $E' = E + E_1\cos(90000t) + E_1\cos(86000t)$ where E_1 is a constant.

Does the signal E carry any information? Justify your answer. If it carries information then find the frequency of the information signal.

(b)

(i) What is amplitude modulation? Explain with the help of a diagram.

(ii) Sketch an amplitude modulated wave with following depths of modulation:

(α) 50%
(β) 100%
(γ) > 100%

Mark the relative values of minimum- and maximum amplitudes of the modulated wave correctly, in each case.

(c) A variable gain amplifier has ***two*** inputs (*A*, *B*) and **one** output (*C*). The signal to be amplified is fed to *A*. The gain of the amplifier can be changed through a signal applied to *B* (gain varies according to the amplitude of the signal applied to *B*).

How can this device be used to generate *amplitude modulation*?

Q7. (a) With the help of a sketch explain the process of *frequency modulation*.

(b) Signal *X* has a frequency of 120 kHz and an amplitude of 10 V. The frequency of *X* is varied by ± 10 % through a signal whose frequency is 2 kHz and the amplitude is 1V.

(i) What is the *modulation index* of the *process?*

(ii) Sketch the approximate *frequency* spectrum of the final signal and calculate the approximate *bandwidth* (not the theoretical *bandwidth*) of the signal. (If the signal is assumed to be a summation of sinusoidal frequencies with different amplitudes then the *frequency spectrum* is the sketch of amplitude vs. frequency)

(iii) What is the theoretical bandwidth of the above signal?

(c) In the transmission of a VHF TV signal what are the modulation techniques employed? State the information signal(s) corresponding to the modulation technique(s) mentioned.