Sri Lanka Institute of Information Technology

B.Sc. Special Honours Degree
in
Information Technology

Final Examination
Year 1, Semester 1 (2017)

Introduction to Computer Systems (IT 1020)

Duration: 2 Hours

Instructions to Candidates:

- This paper is preceded by a 10 minute reading period. The supervisor will indicate when answering may commence.
- This paper contains 4 questions on 5 pages including the coverpage.
- **Answer ALL FOUR QUESTIONS.**
- Each question carries equal marks.
- Total marks for the paper is 100
- This examination accounts for 50% of the overall module assessment.
- This is a closed book examination.

Question 1 **(25marks)**

a) Compare and contrast Quantitative and Qualitative Data with examples.

(2 marks)

b) You are to design a digital logic circuit that takes four binary inputs A, B, C and D where each combination represents a decimal number. A is the most significant bit (MSB). When binary inputs equivalent to the decimal number 0, 1, 2, 6, 7, 8, 9 and 15 are presented, the output F generates HIGH (1). For all other inputs F gives LOW (0).

i) Derive the truth table for the above mentioned circuit.

(3 marks)

ii) Write the Boolean expression for the output F in Sum-of-Product (SOP) form.

(3 marks)

iii) Simplify the Boolean expression that you wrote in (ii) using K-Map method.

(5 marks)

iv) Draw a circuit diagram for your simplified expression in part (iii) using basic logic gates.

(3 marks)

c) Represent the following Sum-of-Product (SOP) expressions using a suitable Programmable Logic Array (PLA).

$$F1 = \overline{A}\overline{B}C + \overline{A}BC + A\overline{B}C + ABC$$
$$F2 = \overline{A}B\overline{C} + A\overline{B}C + AB\overline{C} + ABC$$

(4 marks)

d) The multiplexer or a "MUX" is a combinational logic circuit that is designed to switch one of several input lines to a single common output line.

i) Design a circuit for a 4-1 Multiplexer using basic logic gates.

(3 marks)

ii) State the function table of a 4-1 Multiplexer

(2 marks)

Question 2 **(25marks)**

a) Explain the Von Neumann Architecture used in today's computers with the aid of a diagram.
(3 marks)

b) How many bits are used to address the memory locations of a PC's memory, if the PC has 2GB of main memory (RAM)?
(2 marks)

c) Explain how the Cache Memory increases the speed of a PC.
(3 marks)

d) Describe the Memory Hierarchy of a PC referring to the speed, cost, and capacity. (You may use a suitable diagram to answer this question).
(4 marks)

e) Briefly describe System Bus Architecture referring to its main features.
(5 marks)

f) Writedown the basic functions of three control registers in the CPU.
(3 marks)

g) Briefly explain the instruction fetch cycle with the aid of a suitable illustration.
(5 marks)

Question 3 (25 marks)

a) Networks have changed the way we communicate daily. State 4 types of data/information that can be found in a 'converged' network.

(4 marks)

b) Briefly explain what 'QoS' in a network means. You may use a suitable diagram.

(3 marks)

c) A LAN connects network devices over a relatively small geographical area while a WAN spans across a large geographical area.

i) List down three network devices you can **only** find in a LAN.
ii) List down three network devices used to build a WAN.

(6 marks)

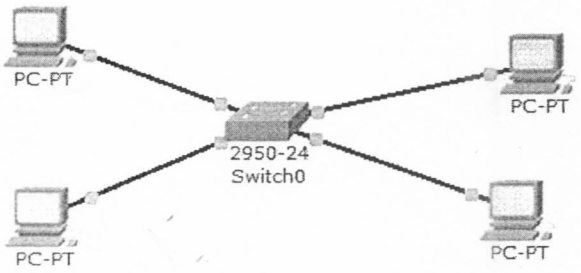
d) ADSL is a popular WAN technology which enables faster data transfer rates using the same copper cable used for public telephone network. Draw a diagram and show how ADSL uses different frequencies in a copper cable for voice communication and data upload/download.

(4 marks)

e) State one advantage and one disadvantage of using the cable type Shielded Twisted Pair (STP).

(4 marks)

f) Study the following network diagram and answer the questions given below.



i) How many collision domains are there in the network?
ii) How many broadcast domains are there in the network?

(4 marks)

Question 4 (25 marks)

a) List down the seven layers of the ISO – OSI reference model in the correct order.
(8 marks)

b) List down one advantage and one disadvantage of each of the protocols TCP and UDP.
(4 marks)

c) Answer the following questions referring to the classful network address 200.38.74.0 What is the:

i) Class of the given network
ii) Subnet mask
iii) Broadcast address
iv) Number of possible hosts in the network

(7 marks)

d) Write down the technology represented by following IEEE 802 standards.

i) IEEE 802.3
ii) IEEE 802.11
iii) IEEE 802.15

(3 marks)

e) State three ways to protect a network from attacks.
(3 marks)