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 (IT1020)

Duration: 2 Hours

Instruction to Candidates:

- This Paper contains 4 questions on 5 pages.
- This paper preceeded by a 10 minutes reading period. The supervisor will indicate when answering may commence.
- Each question carries equal marks.
- Answer ALL FOUR questions.
- The total marks obtainable for this examination is 100.
- This examination accounts for 50% of the module assessment.
- This is a closed book examination.

## Part A-Computer Organization

**Question 1-Data Representations, Kanaugh Maps and Digital Circuits (25 Marks)**

a) Compare and Contrast data and information by giving suitable examples?

**(2 Marks)**

b) A Digital Logic Circuit (DLC) is needed to identify integers which are multiples of 2 or powers of 2. The circuit should have four binary inputs with A being the MSB and the output of the circuit is F. If the entered binary numbers are either powers or multiples of 2, the circuit should output one (1) or else the output should zero (0) .Consider decimal zero as an even number.

i. Construct the truth table for the above mentioned circuit.

**(3 Marks)**

ii. State the Boolean expression for the output F in sum of product (SOP) form.

**(2 Marks)**

iii. Draw a K-map to indicate the SOP that you have written as the answer to part b) ii.

**(5 Marks)**

iv. Obtain the simplified answer for the K-map that you have stated in part b) iii.

**(2 Marks)**

v. Draw a circuit diagram based on the simplified answer that you have written as the answer to b) iv.

**(1 Marks)**

c) Draw a Programmable Logic Array (PLA) to represent following sum of product (SOP) expressions.

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

**(4 Marks)**

d)

i. Draw circuit diagram of a 4-1 Multiplexer.

ii. State the characteristic table of 4-1 Multiplexer.

**(4 Marks)**

e) Draw a circuit diagram of a 2 input binary adder.

**(2 Marks)**

**Question 2-Computer and CPU Organizations, Operating Systems and ISA (25 Marks)**

a) Briefly describe the following.
   i. Operation of Cache Memory
   ii. Data access time of Hard Disk Drives

**(4 Marks)**

b) List down 4 classifications of Operating Systems.

**(4 Marks)**

c)
   i. List down 4 services of an Operating Systems.

**(2 Marks)**

   ii. Briefly explain two of them.

**(2 Marks)**

d) Briefly explain the instruction fetch cycle using suitable illustrations.

**(5 Marks)**

e) Describe the stack and accumulator instruction set architectures for the following codes with aid of diagrams.

| Stack | Accumulator |
|---|---|
| Push A | Load A |
| Push B | Add B |
| Add | Store C |
| Pop C | |

**(8 Marks)**

## Part B- Data Communication and Computer Networks

**Question 3- ISO – OSI Model, It's a Network** **(25 Marks)**

a) List four advantages of using the ISO-OSI seven-layer model. **(4 marks)**

b) Data Link Layer is divided into two sub layers. Name these two sub layers and mention the functionality provided by each layer. **(4 marks)**

c) In the table given below, write down the delivery mechanism used in each layer. (Note: an example is given) **(3 marks)**

| Layer | Delivery Mechanism |
|---|---|
| Application Layer | |
| Presentation Layer | |
| Session Layer | |
| Transport Layer | |
| Network Layer | |
| Data Link Layer | |
| *e.g. Physical Layer* | *Hop-to-Hop Delivery* |

d) Write down the design considerations to be followed when creating a Small Network? **(4 marks)**

e) What are the four main factors to be considered when scaling up a Small Network to a large network? **(4 marks)**

f) Draw a diagram illustrating how your Home PC is connected to the Internet via ADSL.

(Note: Assume that you are connected to the Internet through a wireless network) **(6 marks)**

**Question 4- Ethernet, Addressing in a network** **(25 Marks)**

a) Why does the destination address come first in Ethernet frame? **(2 marks)**

b) Compare and contrast the following with respect to cable length and speed. **(4 marks)**

   a. Fast Ethernet
   b. Gigabit Ethernet

c) Describe Basic Service Set (BSS) and Extended Service Set (ESS) with referring to the wireless standard IEEE 802.11. **(2 marks)**

d) Find the class in each of the IPv4 addresses given. Note that some addresses are given in binary and others in dotted decimal notation. **(2 x 4 marks)**

   a. 11100011.10011011.11111011.00001111
   b. 11010011.10011011.11111011.00001111
   c. 1.1.1.1
   d. 134.11.78.56

e) Given the network address 200.34.76.128/25, find the following.

   **a.** Class **(1 mark)**
   b. Net ID **(1 mark)**
   **c.** Subnet Mask **(2 marks)**
   **d.** 1st usable IP address **(1 mark)**
   **e.** Last usable IP address **(1 mark)**
   **f.** Broadcast Address **(1 mark)**
   g. Total number of IP addresses available in the network. **(2 marks)**

**- End of Paper -**