Sri Lanka Institute of Information Technology

B.Sc. Special Honors Degree
In
Information Technology

Final Examination
Year 1, Semester 1 (2018)

Introduction to Computer Systems (IT1020)

Duration: 2 Hours

Instruction to Candidates:

- This paper contains 4 questions on 5 pages.
- Each question carries equal marks.
- Answer ALL FOUR questions.
- Read all questions before start answering.
- The total marks obtainable for this examination is 100.
- This is a closed book examination.

Part A: Computer Fundamentals

Question 1: Memory, Storage types and Operating Systems **[25 Marks]**

I. State four (4) characteristics of 5th Generation Computers. [4 Marks]

II. Briefly explain the types of storage and their characteristics. [6 Marks]

III. Using a diagram briefly explain the memory hierarchy of a computer. [4 Marks]

IV. Briefly explain the Following. [6 Marks]

a. Memory Address Register (MAR).

b. Memory Data Register (MDR)

c. Read-only Memory (ROM)

V. Explain why computers need an Operating System. [3 Marks]

VI. State four (4) services provided by the Operating Systems. [2 Marks]

Question 2: K-Maps and Digital Logical Circuits **[25 Marks]**

I. What are the differences between Combinational and Sequential Logic Circuits? [2 Marks]

II. Draw a Logic Circuit for the Boolean Expression given bellow. [2 Marks]

$$Y = \overline{AC} + \overline{BC} + ABC$$

III. Simplify the above mentioned Boolean Expression using Karnaugh map (K-map) method. [3 Marks]

[Hint: $X + \overline{X} = 1$]

IV. A Boolean function is listed as follows:

$F(A,B,C,D) = \sum m\ (0,2,3,8,10,12,14,15)$ and Don't care conditions: $d(A,B,C,D) = \sum m\ (1, 4, 11)$

(a) Derive a truth table for the above Boolean function. [2 Marks]

(b) Obtain the Boolean function in SOP (Sum-of-product) form. [2 Marks]

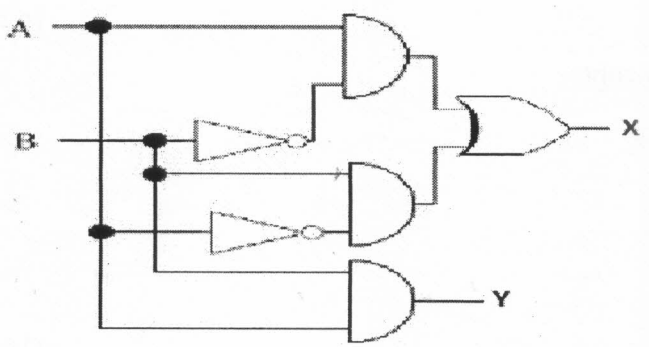
(c) Simplify the above function in (b) using a K-map. [4 Marks]

(d) Draw the circuit diagram for the simplified expression in (c) using basic logic gates. [2 Marks]

V. Four large tanks at a chemical plant contain different liquids which are being heated. Liquid-level sensors are being used to detect whenever the level in the tanks A and B rises above a predetermined level. Temperature sensors in tanks C and D detect when the temperature in those tanks drops below a prescribed temperature limit. Assume that the liquid-level sensor outputs A and B are LOW when the level is satisfactory and HIGH when the level is too high. Also, the temperature-sensor outputs C and D are LOW when the temperature is satisfactory and HIGH when the temperature is too low. Design a logic circuit that will detect whenever the level in tank A or B or both A and B is too high at the same time and the temperature in tank C or D or both is too low.

[3 marks]

VI. Consider the circuit given below.



a. Derive the truth table and determine the outputs X and Y. [2 Marks]

b. Design a different Logic Circuit to get the same outputs for X and Y. [3 Marks]

Part B- Computer Networks

Question 3 - Computer Networks, Network Devices, Transmission Media [25 Marks]

I. List four major elements of a computer network. [4 Marks]

II. Based on the covered geographical area, computer networks can be divided into three categories: Local Area Networks (LANs), Wide Area Networks (WANs) and Metropolitan Area Networks (MANs).

Briefly explain LANs and WANs including following details:

a. Size of the network
b. Network devices used
c. Technologies used [6 Marks]

III. Briefly explain following concepts:

a. Unicast
b. Multicast
c. Broadcast
d. Collision domain
e. Broadcast domain [10 Marks]

IV. Compare and contrast guided transmission media and un-guided transmission media. [5 Marks]

Question 4 – ISO/OSI Reference Model, IP Addressing [25 Marks]

I. List the 7 layers of ISO/OSI reference model [3 Marks]

II. Using a diagram, briefly explain the functions of each IOS/OSI layer, when we send data from a source computer to a destination computer. [8 Marks]

III. Briefly explain 3 types of addresses used in networks. [3 Marks]

IV. Find the class of the following IPv4 addresses. Note that some addresses are in binary and others in dotted decimal notation. [4 Marks]

a. 11100111.10011011.11111001.00001100
b. 11010010.10011000.11111011.00001111
c. 10.16.1.10
d. 142.1.1.20

V. If host A is allocated the ip address: 152.10.10.12, find following information regarding the network:

a. Class
b. Net ID
c. Subnet Mask
d. First usable IP address
e. Last usable IP address
f. Broadcast Address
g. Total number of IP addresses available in the network [7 Marks]