Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Final Examination
Year 1, Semester 1 (2019)

IT1020 – Introduction to Computer Systems

Duration: 2 Hours

June 2019

Instructions to Candidates:

- This paper is preceded by 10 minutes reading period. The supervisor will indicate when answering may commence.
- This paper has 4 questions.
- Answer all questions in the booklet given.
- The total marks for the paper is 100.
- This paper contains 4 pages, including the cover page.
- Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.

Question 1 [25 Marks]

a) List two characteristic features of each computer generation.

(5 marks)

b) A computer system is comprised of many short-term and long-term storage devices. All these storage devices create a hierarchy of components. Draw a diagram illustrating the features of this hierarchy and describe the characteristic features of this hierarchy.

(6 marks)

c) List three special purpose registers available inside a microprocessor. Describe the role played by each of these registers.

(6 marks)

d) Briefly describe the activities performed by a microprocessor during an instruction cycle (fetch-decode-execute cycle)

(4 marks)

e) Compare and contrast RISC and CISC processors. List real world applications of these processors.

(4 marks)

Question 2 [25 Marks]

a) The Fibonacci sequence is the series of numbers: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, ... The next number of the series is found by adding up the two numbers before it. You have been asked to design a digital circuit which will light a bulb when a Fibonacci number is detected from the input. Please limit your design to input a number between 0 to 7, given as a binary input.

i. Write the truth table to express input-output behavior of the circuit.

(3 marks)

ii. Write down the function of the circuit as a SoP after simplifying it using a K-map.

(4 marks)

iii. Draw the circuit diagram to implement the above circuit using basic logic gates.

(3 marks)

iv. Illustrate how the same circuit can be implemented using a 3-8 Decoder and an OR gate.

(2 marks)

b) *"Operating system is a program that act as a mediator between a user of a computer and the computer hardware."*
Describe the roles played by an operating system as a mediator.

(4 marks)

c) Storage management is an important service provided by an OS. Briefly describe the storage management services provided by an OS to satisfy different user requirements.

(4 marks)

d) What are the features of mobile operating systems used in smart phones that are different from the operating systems used in desktop computers?

(3 marks)

e) What is the meaning of FOSS? Describe an OS supported by the FOSS community.

(2 marks)

Question 3 [25 Marks]

a) Convert the following IP address from the binary notation to dotted-decimal notation and mention the class of the IP address

(4 marks)

i. 11010010.10011000.11111011.00001111

b) Convert the following IP address from the dotted-decimal notation to binary notation and mention the class of the IP address

(4 marks)

i. 10.16.1.10

c) ABC company has a network for their IT department and the IP address of one of the PC's in the network is 201.70.64.56. As the systems engineer it is your duty to maintain a record of the IP addresses. Therefore, calculate the following;

i. What is the class of the given IP address? (2 marks)

ii. What is the subnet mask of the network? (2 marks)

iii. What is the network address? (2 marks)

iv. What are the first two usable IP addresses, which can be assigned to devices (4 marks)

v. What are the last two usable IP addresses, which can be assigned to devices (4 marks)

vi. Currently the IT department has only 25 computers in the network. How many additional computers can be added to same network?

(3 marks)

Question 4 [25 Marks]

a) Briefly explain what a network protocol is. (02 marks)

b) Explain what do you mean by a Network Topology? (02 marks)

c) List four types of physical threats in a network. (04 marks)

d) "From the largest company to the smallest store, none of the businesses are 100% safe from a cyber-attack."

   i. Do you agree or disagree with the above statement? Justify your answer. (02 marks)

   ii. Briefly discuss four techniques that can be applied to mitigate such type of attacks within an organization. (05 marks)

e) Draw a diagram indicating how a home user is connected to the Internet. You may assume this home is given an ADSL connection. You must clearly show the following components in your diagram. (10 marks)

   i. End devices (e.g., mobile phones)
   ii. Network media (e.g., Wireless)
   iii. LAN
   iv. WAN
   v. Network devices (e.g., switches)
   vi. ISP