WOMEN'S UNIVERSITY IN AFRICA

Addressing gender disparity and fostering equity in University Education

FACULTY OF MANAGEMENT AND ENTREPRENEURIAL SCIENCES

BSc HONOURS DEGREE IN INFORMATION SYSTEMS

BSc HONOURS DEGREE IN COMPUTER SCIENCE

MAIN PAPER

IS 111: COMPUTER HARDWARE ARCHITECTURE

HCS122: COMPUTER ORGANISATION AND ARCHITECTURE

INTAKE 27: FIRST YEAR FIRST SEMESTER

INTAKE 2: FIRST YEAR SECOND SEMESTER

TIME: 2 HOURS AFTERNOON

INSTRUCTIONS TO CANDIDATES

Answer any **four** questions.

Question 1

a) You are employed as a consultant to select a suitable high-performance computer for use by a small company. You make your selection and copy out the candidate computer's parameters (specification) for your client. Because your client is non-technical, you have to explain the relevance of some of the parameters. For the following specifications, write short notes that indicates the meaning, relevance, and importance of the specified parameter. Your report should also explain why this specification corresponds to a high performance computer (in 2020).

Workstation specifications:

A. Processor:
   i. CPU cores: 8
   ii. CPU threads: 16
B. Memory: 64 GB, DDR4
C. CPU clock: 4.7 GHz
D. Storage device:
   i. 2 TB SSD
   ii. 10 TB HDD
E. Interface:
   i. USB 3.0
   ii. USB 3.1 Type-C
F. Extension slots: 4 x PCIe
G. Network: Gigabit Ethernet [20]

b) Some people use a computer's clock speed to judge the performance (speed) of a computer; for example, they may say that computer X is better than computer Y because computer X has a 3.5 GHz clock and computer Y has a 3.1 GHz clock. In general, it is regarded as wrong to use clock frequency to compare computers. Why is this? [5]

Question 2

a) What is an operating system; why is it necessary on a general-purpose computer, and what facilities does it provide? [12]

b) In the context of operating systems:
   i. What is virtual memory? [2]
   ii. Why is virtual memory necessary? [5]
   iii. How is virtual memory implemented? [6]

Question 3

a) The performance of microprocessors has been improving exponentially since they were first manufactured. However, over the last few years, the advance of microprocessor performance has slowed. Why is this; what is limiting the increase in microprocessor performance? [8]

b) How are computer manufacturers attempting to increase the performance of microprocessors? [10]

c) Define a cache memory and, explain how it improves performance of a microprocessor system. [7]

Question 4

a) Briefly explain each of the following concepts:

i. HDMI; [4]

ii. VGA; [4]

iii. DVI; and [4]

iv. S/PDIF. [3]

b) The operation of the simple von Neumann computer with its fetch/execute cycle has been enhanced by several techniques to improve its performance. Write notes on any one of the following three mechanisms that are found in most computers. State what the technique is, how it works, and why it increases computer performance. The interrupt or Virtual memory or Direct memory access (DMA). [10]

Question 5

a) A modern computer's secondary storage memory may consist of a combination of hard disk drives (HDDs), solid state drives (SSDs), and Blu-ray optical drives. Describe the operating principles of each of these storage devices and compare and contrast their fundamental characteristics. [20]

b) What role does the operating system play in managing secondary storage? [5]

Question 6

Computer performance is regarded as important today; users want the best performance possible for the computers they buy.

a. Discuss the factors that contribute to the overall performance of a desk-top computer. [10]

b. Explain how the performance of computers is measured today and how different computers are compared. Your answer should include several ways by which computer performance can be measured and you should comment on the accuracy/relevance of each of the measurement techniques. [15]

END