THE UNIVERSITY OF ZAMBIA

SCHOOL OF NATURAL SCIENCES

DEPARTMENT OF COMPUTER SCIENCE

CSC 2101 – INTRODUCTION TO COMPUTER SYSTEMS

2017/2018 TEST ONE

DURATION: 1 HR 30 MINUTES

DATE: MONDAY 7TH MAY, 2018

QUESTION ONE

a. Name ***three (3)*** appliances that are candidates for being run by an embedded CPU. [6 marks]

b. Babbage's difference engine had a fixed program that could not be changed. Is this essentially the same thing as a modern CD-ROM that cannot be changed? Explain your answer. [4 marks]

c. A certain computer can be equipped with 268,435,456 bytes of memory. Why would a manufacturer choose such a peculiar number, instead of an easy-to-remember number like 250,000,000? [2 marks]

d. A computer has a bus with a 5 nsec cycle time, during which it can read or write a 32-bit word from memory. The computer has an Ultra4-SCSI disk that uses the bus and runs at 160 Mbytes/sec. The CPU normally fetches and executes one 32-bit instruction every 1 nsec. How much does the disk slow down the CPU? [5 marks]

5 nsec → 32 bit

e. List down the four basic components of the Central Processing Unit, stating the main function of each component [12 marks]

QUESTION TWO

a. Define the following; [6 marks]

   i. Programming Language

   ii. Syntax

   iii. Semantics

b. What is the meaning and what role do the following play in the CPU: [8 marks]

   i. MAR

   ii. MBR

   iii. I/O AR

   iv. PC

c. Using an n-bit address, determine the value of n required to address 1023 cells. With this value of n, what will be the addresses of the last two cells in binary? [5 marks]

d. List and explain ***five (5)*** services provided by the operating system [10 marks]

e. Discuss the following ROM variations: [4 marks]

   i. PROM

   ii. EPROM

QUESTION THREE

a. What is a compiler? [2 marks]

b. Compiling analysis consists of three phases. Explain each phase: [6 marks]

   i. Linear analysis

   ii. Hierarchical analysis

   iii. Semantic analysis

c. A compiler operates in phases, each of which transforms the source program form one representation to another. Consider a particular compiler that outputs assembly code, given the following statement: ***position := initial + rate * 60***, show the various outputs from each phase of compilation. Assume all identifiers have been declared to be real numbers and that 60 by itself is declared to be an integer [10 marks]

d. What is an interconnection structure? Give two (2) examples of interconnection structures [4 marks]

e. Define ***three (3)*** functional groups into which bus lines can be classified and state the significance of each classification width. [12 marks]

System bus
Local bus
CPU Connection
Memory connection
I/O connection