

University of Ruhuna - Faculty of Technology

Bachelor of Information & Communication Technology

Level 1 (Semester 2) Examination - December 2017

Department: Information & Communication Technology

Time: 2 hours

Course Unit: ICT1252 (Computer Architecture)

Answer all four (4) questions

1)

a)

- i) Name the four general categories of computer functions.
- ii) Write down the main components of a computer considering its top-level view.
- iii) Write down two problems related to single bus architecture.
- iv) Briefly explain the two main types of dedication in bus architecture.

b)

- i) Briefly describe two ways to handle multiple interrupts.
- ii) Assume a situation with a currently running user program and a pending interrupt. Write down the steps that processor must take to handle this situation.
- iii) Write down main purpose of the program counter.
- iv) The following diagram shows the states of memory and CPU registers before executing an instruction. Clearly draw the steps of adding content of memory location 666 to content of memory location 667 and briefly describe each fetch and execute cycle separately.

(Note: Consider that both instructions and data are 16 bits long.)

Use the following list of op codes:

0001 – Load AC from memory

0010 – Store AC to memory

0101 – Add to AC from memory)

224	1887	225	PC
225	1666		A
226	5667		IR
227	2666		
	—		
666	0004		
667	0001		
668	0002		

PC – Program Counter

AC- Accumulator

IR – Instruction Register

2)

a)

- i) Write down the main task of short-term scheduler.
- ii) Explain the difference between paging and demand paging memory management mechanisms.
- iii) Define the concept *Locality of Reference*.
- iv) Explain the terms *Hit* and *Miss* in locality of reference.
- v) Name the two basic write policy techniques used in replacing a cache line.
- vi) Briefly describe the two techniques you wrote in 2) a) v).

b) Consider a memory system that uses a 32-bit long address and a cache that uses a line size of 32-bytes. Assume a direct mapped cache with a tag field of 12 bits in its address.

- i) Write down the meaning of direct mapping.
- ii) Calculate the values of following parameters.
 - Number of addressable units in the main memory
 - Number of bits in a word
 - Number of blocks in the main memory
 - Number of lines in cache

3)

a)

- i) Name two common characteristics of Redundant Array of Independent Disks (RAID).
- ii) Write down two advantages and two disadvantages of CD-ROM.
- iii) Define the terms *Seek Time*, *Rotational Latency* and *Access Time* in a magnetic disk.
- iv) Write down the main difference between fixed head and movable head architectures in magnetic disks.

b)

- i) List three differences between Static Random Access Memory (SRAM) and Dynamic Random Access Memory (DRAM).
- ii) Differentiate between EPROM and EEPROM, considering the writing mechanisms used.
- iii) Calculate the check bits for the data word 1110 using hamming error correction code using the following table 1. Fill the bit position, position number, data bits and check for the given data word.

Bit position							
Position number							
Data bits							
Control/Check bits							

Table 1

iv) Draw the Venn diagram corresponding to the check bits for the given data word in 3) b) iii).

4)

a)

- i) Briefly describe register addressing and indirect addressing using appropriate diagrams.
- ii) Write down one disadvantage each for register addressing and indirect addressing mentioned in 4) a) i).
- iii) Name two types of operands and two types of operations used in instruction sets of a computer.
- iv) Write down the results after applying each of the following operations two times on the data word 10111001.
 - Logical Right Shift
 - Logical Left Shift
 - Arithmetic Right Shift
 - Arithmetic Left Shift

b)

- i) List down the four main categories of user visible registers.
- ii) Name two types of pipeline hazards and briefly describe each of them.
- iii) Multiply -5(multiplicand) by 6(multiplier) using Booth's Algorithm. Use 4-bit binary representation and clearly write down all the intermediate steps you follow.
- iv) Convert the answer you obtained in 4) b) iii) in to decimal. Clearly write down the steps you follow.