

**UNIVERSITY OF SWAZILAND**  
**Faculty of Science**  
**Department of Computer Science**  
**SUPPLEMENTARY EXAMINATION July 2016**

**Title of Paper: COMPUTER ORGANISATION II**

**Course Number: CS341**

**Time Allowed: 3 hours**

**Total Marks: 100**

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**Instructions to candidates:**

This question paper consists of FIVE (5) questions.

Answer any FOUR (4) questions. Marks are indicated in the square brackets.

*All questions carry equal marks.*

**SPECIAL REQUIREMENTS:**

**NO CALCULATORS ALLOWED**

**THIS EXAMINATION PAPER SHOULD NOT BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR**

## QUESTION 1

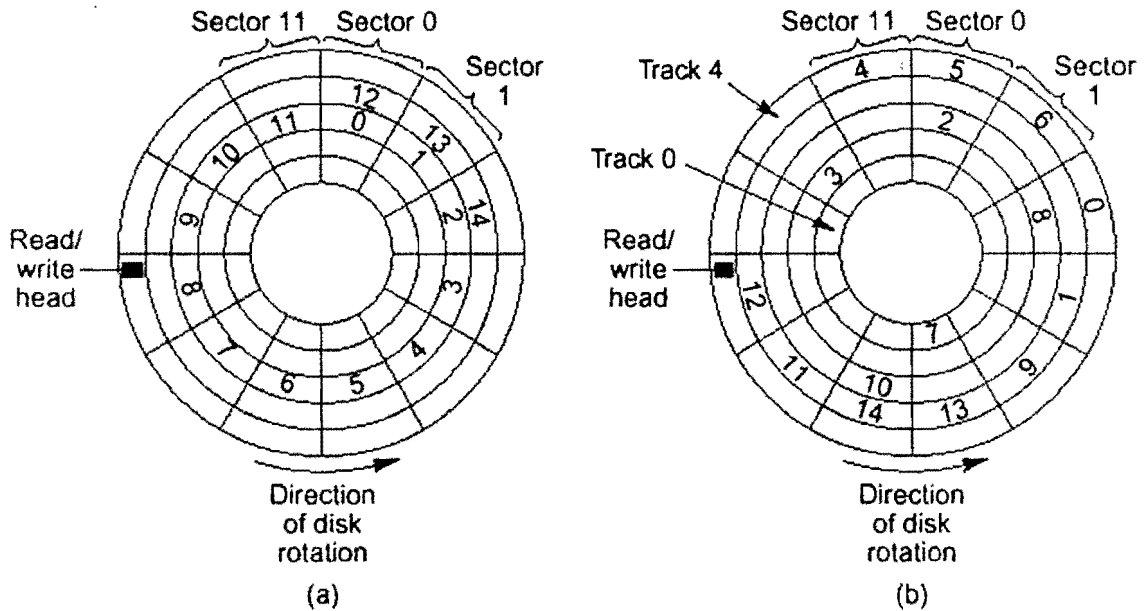
- A) What is the main purpose of the control store? Communication with memory can be done in 2 different ways. State and briefly describe the 2 ways in which memory access can be achieved. [7]
- B) With the aid of appropriate diagrams, describe the following allocation algorithms:
- i) First fit
  - ii) Worst fit [8]
- C) With the aid of suitable diagrams compare the following:
- i) Cache miss and page fault
  - ii) Conditional and unconditional branching [8]
- D) Why does the Intel have segment registers and SPARC not? [2]

## QUESTION 2

- A) Describe the 3 differences between **programmed I/O** and **Interrupt driven I/O** [6]
- B) Given memory partitions of 100K, 500K, 200K, 300K, and 600K (in order), how would each of the First-fit, Best-fit, and Worst-fit algorithms place processes of 212K, 417K, 112K, and 426K (in order)? Which algorithm makes the most efficient use of memory? [9]
- C) Assume you have an expanding *opcode* that supports the following formats, with a 3 bit register:
- 4 instructions with 3 registers
  - 255 instructions with one register
  - 16 instructions with zero registers:
- i. How many *opcodes*, in total, does the preceding require? [3]
  - ii. How many bits does the *opcode* require to support the 3 formats? [3]
- D) Explain, using a suitable illustration, how semaphores work. [4]

**QUESTION 3**

- A) What is the difference between an instruction and a pseudoinstruction? [2]
- B) What is addressing *orthogonality*? [2]
- C) Convert the infix formula  $(a+cd+7)/x+(cy-4)$  to postfix [5]
- D) Create a **bit-map** and a **free-list** for the disk shown in (b) below. Occupied blocks are marked with a number. [16]



**QUESTION 4**

Describe in not more than 80 words each, using correct terminology and illustrations:

- A) Segmentation. [10]
- B) Paging. [10]
- C) Paged segmentation. [5]

## QUESTION 5

A) Using Amdahl's law on a given program which has 50% sequential code and 50% parallel:

- i. What is the speed up anticipated with two processors? [5]
- ii. What about 4 processors? [4]
- iii. How many processors would result in a 4-fold speedup? [4]

B) Four (4) CPU s are connected by a bus whose bandwidth is  $r$  MB/sec, by what percentage has the bandwidth changed if the system is scaled to 22 CPUs. [6]

C) Suppose that for technical reasons it is only possible for a snooping cache to snoop on the address lines, not data lines. Would this change affect the *write through* protocol? [6]

<< End of Question Paper >>