



UNIVERSITY EXAMINATIONS

EXAMINATION FOR 2016 BACHELOR OF SCIENCE IN COMPUTER SCIENCE

UNIT CODE: RCCS 205

UNIT NAME: OPERATING SYSTEMS

DATE: 4st, April, 2016

TIME: 2 HOURS

GENERAL INSTRUCTIONS:

Students are NOT permitted to write on the examination paper during reading time.

This is a closed book examination. Text book/Reference books/notes are not permitted.

SPECIAL INSTRUCTIONS:

This examination paper consists Questions in Section A followed by section B.

Answer **Question 1 and any Other Two** questions.

QUESTIONS in ALL Sections should be answered in answer booklet(s).

1. **PLEASE start the answer to EACH question on a NEW PAGE.**
2. **Keep your phone(s) switched off at the front of the examination room.**
3. **Keep ALL bags and caps at the front of the examination room and DO NOT refer to ANY unauthorized material before or during the course of the examination.**
4. **ALWAYS show your working.**
5. **Marks indicated in parenthesis i.e. () will be awarded for clear and logical answers.**
6. **Write your REGISTRATION No. clearly on the answer booklet(s).**
7. **For the Questions, write the number of the question on the answer booklet(s) in the order you answered them.**
8. **DO NOT use your PHONE as a CALCULATOR.**
9. **YOU are ONLY ALLOWED to leave the exam room 30minutes to the end of the Exam.**
10. **DO NOT write on the QUESTION PAPER. Use the back of your BOOKLET for any calculations or rough work.**

SECTION A (Compulsory)

Question One (30marks)

- a. Describe the two general roles of an operating system **(2marks)**
- b. Name two current operating systems **(2marks)**
- c. List two situations that might demand a real-time operating system and explain why. **(3marks)**
- d. Given the following information:
Job list

Job Number	Memory Requested	Memory Block	Memory Block Size
Job 1	690 K	Block 1	900 K(Low-order memory)
Job 2	275 K	Block 2	910 K
Job 3	760 K	Block 3	300 K(high-order memory)

- i. Use the best-fit algorithm to indicate which memory blocks are allocated to each of the three arriving jobs. **(2marks)**
- ii. Use the first-fit algorithm to indicate which memory blocks are allocated to each of the three arriving jobs. **(2marks)**
- e. Describe at least two threats to a data center posed by disgruntled employees. **(2marks)**
- f. List and describe the four memory allocation algorithms. **(4marks)**
- g. What is a process? **(2marks)**
- h. Describe at least three state process models. **(3marks)**
- i. Identify and describe two vulnerabilities of an operating system of your choice. **(2marks)**
- j. Name and describe three types of devices **(3marks)**
- k. Describe the purpose of the working directory and how it can speed or slow file access. **(2marks)**
- l. Identify three responsibilities of a file manager. **(3marks)**

SECTION B (ANSWER ANY TWO QUESTIONS)

Question Two (20marks)

- a. Name the five key concepts about an operating system that you think a novice user needs to know and understand. **(5marks)**
- b. In a multiprogramming and time-sharing environment, several users share the system simultaneously. This situation can result in various security problems. Name two such problems. **(2marks)**
- c. Define the following terms as used in an operating system **(3marks)**

- i. Program
 - ii. Thread
 - iii. Multiprogramming
- d. What is the relationship between threads and processes? **(2marks)**
 - e. Describe the difference between **job scheduler** and **process scheduler** **(4marks)**
 - f. What are the four conditions required for **deadlock** to occur. **(4marks)**

Question Three (20marks)

- a. Explain the fundamental differences between internal fragmentation and external fragmentation. **(4marks)**
- b. For each of the four memory management systems (single user, fixed, dynamic, and relocatable dynamic), identify which one of each causes which type of fragmentation. **(4marks)**
- c. Which type of fragmentation is reduced by compaction? Explain your answer. **(2marks)**
- d. Imagine an operating system that does not perform memory deallocation. Name at least two unfortunate outcomes that would result and explain your answer. **(2marks)**
- e. Describe *page-based virtual memory*. (Consider *pages, frames, page tables, and Memory Management Units* in your answer) **(4marks)**
- f. Compare and contrast a fixed partition system and a dynamic partition system. **(4marks)**

Question Four (20marks)

- a. Explain the fundamental differences between interactive, batch, real-time, and embedded systems. **(8marks)**
- b. Describe the four key properties of survivable systems **(8marks)**
- a. Identify any four biggest security challenges and how you would address each of them. **(4marks)**

Question Five (20marks)

- a. Five jobs (A, B, C, D, & E) are already in the READY queue waiting to be processed. Their estimated CPU cycles are respectively: 2, 10, 15, 6, and 8. Using SJN, in what order should they be processed? **(2marks)**

b. Use the following information to answer the following questions (i, ii and iii):

Job	Arrival Time	CPU cycle
A	0	10
B	2	12
C	3	3
D	6	1
E	9	15

- i. Draw a timeline for each of the following scheduling algorithms. (It may be helpful to first compute a start and finish time for each job.) **(4marks)**
 - a. FCFS
 - b. SJN
 - c. SRT
 - d. Round robin (using a time quantum of 5, ignore context switching and natural wait)

- ii. Calculate which jobs will have arrived ready for processing by the time the first job is finished or interrupted using each of the following scheduling algorithms. **(4marks)**
 - a. FCFS
 - b. SJN
 - c. SRT
 - d. Round robin (using a time quantum of 5, ignore context switching and natural wait)

- iii. Compute the waiting time and turnaround time for every job for each of the following scheduling algorithms (ignoring context switching overhead). **(4marks)**
 - a. FCFS
 - b. SJN
 - c. SRT
 - d. Round robin (using a time quantum of 2)

- c. Describe context switching in lay terms **(2marks)**
- d. Explain four general strategies for dealing with deadlocks. **(4marks)**