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**UNIVERSITY REGULAR EXAMINATIONS  
2012/ 2013 ACADEMIC YEAR**

**FOR THE BACHELOR OF SCIENCE IN  
COMPUTER SCIENCE**

**COURSE CODE: CSC 221**

**COURSE TITLE: OPERATING SYSTEMS DESIGN**

**DATE: 16<sup>th</sup> APRIL 2014**

**TIME: 9.00am – 12.00 noon**

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**Instructions**

Answer all questions in Section A and any two in Section B

## SECTION A

### Question One [30 Marks]

- a) Distinguish between the following terms:
- i. Interrupt and trap [2 Marks]
  - ii. Pre-emptive and non pre-emptive scheduling [2 Marks]
  - iii. Passive and active security [2 Marks]
  - iv. CPU burst and an I/O burst [2 Marks]
- b) The OS needs to know when the I/O device has completed an operation and when the I/O operation has encountered an error. List and explain two ways in which the operating system can achieve this [4 Marks]
- c) i) Explain the relationship between the process and thread [2 Marks]  
ii) State two advantages and two disadvantages of user-level threads [4 Marks]
- d) State and explain four necessary conditions for a deadlock to occur [4 Marks]
- e) Explain why a modular kernel may be the best of the current operating system design techniques [4 Marks]
- f) List and describe the four memory allocation algorithms [4 Marks]

## SECTION B

Answer any two questions from this section

### Question Two [20 Marks]

- a) What is an I/O interface? [3 marks]
- b) Discuss the three types of I/O interfaces [9 Marks]
- c) Discuss the role of operating systems in I/O interface management [8 Marks]

### Question Three [20 Marks]

- a) Explain what is meant by multiprocessor system, distinguish between a symmetric and asymmetric modes of multiprocessing [6 Marks]
- b) Consider a situation whereby there are 2 processes, P1, and P2, and 3 identical resources R1, R2 and R3. Assuming that each process requires a maximum of 2 resources at any one time, explain if there is a deadlock. Illustrate your answer [7 Marks]
- c) Describe the relationship between an API, the system-call interface, and the operating system [7 Marks]

### Question Four [20 Marks]

- a) What are the two most important functions of the Virtual File System (VFS) layer? [4 Marks]
- b) Discuss monolithic kernel, Micro kernel and Exokernel architectures [8 Marks]
- c) Discuss the difference between time-sharing and real-time systems [8 Marks]

### Question Five [20 Marks]

- a) Briefly describe the design steps involved when a file system creates a new file [6 Marks]
- b) File systems store several important data structures on the disk explain them [6 Marks]
- c) File systems organize storage on disk drives in form of layers. With the help of a diagram discuss the layers [8 Marks]