

EGERTON

UNIVERSITY



## UNIVERSITY EXAMINATIONS

REGULAR NJORO CAMPUSSECOND SEMESTER, 2016/2017 ACADEMIC YEARSECOND YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCECOMP 225: OPERATING SYSTEMS

STREAM: BSC. COMPUTER SCIENCE

TIME: 2 HRS

EXAMINATION SESSION: JUNEEXAM TIME: 2017

## INSTRUCTIONS

- i) Answer question ONE and any other TWO questions
- ii) Write on both sides of the answer sheet
- iii) Begin each new answer on a separate page of the answer sheet

## QUESTION ONE (30 MARKS) - COMPULSORY

(2 Marks)

- a) i) What is an Operating System? (2 Marks)
- ii) What do you understand by the term Privilege state with reference to the Kernel. (3 Marks)
- iii) Give the three major goals of an operating system. (3 Marks)
- b) Mention at least two activities of an OS with regard to the following: (2 marks)
  - i) Process management (2 Marks)
  - ii) Main Memory management (2 Marks)
  - iii) File management (2 Marks)
  - iv) Secondary storage Management (2 Marks)

- c) Illustrate the general data structure (relevant matrices) for detecting deadlock for a system with multiple resource instances. (5 marks)
- d) Briefly describe how the multilevel feedback queue algorithm works. (4 marks)
- e) When is a system in safe state? (2 marks)
- f) Briefly describe the two components of I/O devices. (4 marks)

**QUESTION TWO (20 MARKS)**

- a) i) What is a process? (2 Marks)  
ii) What does a process state consist of? (4 marks)
- b) State four principle events that lead to process creation (4 Marks)
- c) i) What is a thread and how does it differ from a process? (4 Marks)  
ii) What is context switching? (2 Marks)
- iii) With the help of a suitable diagram show the contents of the PCB. (4 Marks)

**QUESTION THREE (20 MARKS)**

- a) i) Mention four general strategies for dealing with deadlocks and describe at least two of them. (6 marks)
- b) i) Assuming the operating system detects the system is deadlocked, what can the operating system do to recover from deadlock? (3 marks)
- ii) Describe the general strategy behind *deadlock prevention*, and give an example of a practical deadlock prevention method. (3 marks)
- iii) Below is an example of multiple resource allocation. Show how deadlock can be detected. (8 marks)

$$E = (5 \ 1 \ 5 \ 3), A = (2 \ 0 \ 2 \ 1),$$

$$C = \begin{bmatrix} 0 & 1 & 2 & 1 \\ 1 & 0 & 1 & 0 \\ 2 & 0 & 0 & 1 \end{bmatrix} \quad R = \begin{bmatrix} 2 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 2 & 0 \end{bmatrix}$$

**QUESTION FOUR (20 MARKS)**

- a) Mention at least four page replacement algorithms. (4 marks)

- b) i) What is *swapping* with reference to MMUs? (2 marks)
- ii) Illustrate memory management with Bit maps and linked lists for five processes as described in the table below. (4 marks)

location	Process/Hole	Start position	Size (Bits)
1	P1	0	5
2	H1	5	3
3	P2	8	6
4	P3	14	4
5	H2	18	2
6	P4	20	8
7	P5	28	6
8	H3	34	4

- iii) Illustrate how space is allocated for growing data segment or for growing stack and data segment. (4 marks)
- c) Briefly explain how the following algorithms work:
- i) Not Recently Used page replacement (3 marks)
- ii) Second chance replacement algorithm (3 marks)

#### QUESTION FIVE (20 MARKS)

- a) i) Define and briefly explain the working of Semaphore. (4 Marks)
- ii) When are resources said to be either pre-emptable or non-pre-emptable. (4 Marks)
- b) i) Briefly describe at least three Disk scheduling algorithm. (6 marks)
- ii) Given that the cylinder request queue (FIFO ordering) has the following details: 38, 67, 43, 6, 75, 54, 77 and that the disk head position is at cylinder 60, show the seek pattern under SSTF and C-SCAN strategies. (6 marks)

\*\*\*\*\*END OF EXAM\*\*\*\*\*