EGERTON UNIVERSITY

UNIVERSITY EXAMINATIONS

REGULAR NJORO CAMPUS

SECOND SEMESTER, 2017/2018 ACADEMIC YEAR

SECOND YEAR RESIT/SPECIASL EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

COMP 225: OPERATING SYSTEMS

STREAM: BSC. COMPUTER SCIENCE TIME: 2 HRS

EXAMINATION SESSION: OCTOBER YEAR: 2018

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

a) Give one of the possible definitions of an Operating System. **(2 marks)**

b) Which are the four basic desires of any operating system? **(2 marks)**

c) i) What is Process Control Block (Task Control Block)? **(2 marks)**

ii) Mention at least four contents of the PCB. **(2 marks)**

iii) Using a labeled diagram, show all the possible states and transitions that a process can go through from entry to exit. **(6 marks)**

d) What other uses can you find for semaphores other than mutual exclusion (give one example)? **(2 marks)**

e) Briefly describe how the multilevel feedback queue algorithm works. **(4 marks)**

f) i) Mention and briefly explain the four conditions for deadlock top occur. **(4 marks)**

ii) When is a system in safe state? **(2 marks)**

g) Briefly describe the two components of I/O devices. **(4 marks)**

(20 MARKS)

QUESTION TWO

a) What is "Race Condition"? **(2 marks)**

b) i) Describe Context Switching. **(3 marks)**

ii) Show how to implement user- level threads, Kernel level threads and a hybrid of the two. **(6 marks)**

c) Suppose that the following processes P1-P4 arrive for execution at the times indicated. Using Batch system's shortest Job First with Pre-emption,.

Process	Arrives	Requires
P1	0	40
P2	10	20
P3	20	10
P4	30	30

i) Illustrate graphically how the jobs above will be serviced by a single processor system. **(4 marks)**

ii) Show the order of execution **(1 marks)**

iii) Calculate the average wait time **(2 marks)**

iv) Calculate the average turn around **(2 marks)**

(20 MARKS)

QUESTION THREE

a. i) Mention four general strategies for dealing with deadlocks and describe at least two of them. **(6 marks)**

ii) For single unit resources, we can model resource allocation and requests as a directed graph connecting processes and resources. Given such a graph, what is involved in deadlock detection. **(3 marks)**

b) What is the maximum file size supported by a file system with 16 direct blocks, single, double, and triple indirection? (The block size is 512 bytes and Disk block numbers can be stored in 4 bytes). **(4 marks)**

c) Mention at least four page replacement algorithms. **(2 marks)**

d) 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

QUESTION FIVE **(20 MARKS)**

a) Which are the two basic architectures for the memory-Mapped I/O? **(2 marks)**

b) Illustrate using a suitable diagram and describe the operation of a Direct Memory Access (DMA). **(6 marks)**

c) 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 **********

b. A system with four processes has resources allocated as the tables below:

Current allocation matrix

P1	1	3
P2	4	1
P3	1	2
P4	2	0

Current request matrix

P1	1	2
P2	4	3
P3	1	7
P4	5	1

Availability Vector

1	4

i) Is the system deadlocked? (3 marks)

ii) If the availability vector is as below, is the system above still deadlocked? (3 marks)

2	3

c. i) Assuming the operating system detects the system is deadlocked, what can the operating system do to recover from deadlock? (2 marks)

ii) Describe the general strategy behind *dealock prevention*, and give an example of a practical deadlock prevention method. (3 marks)

QUESTION FOUR (20 MARKS)

a) List and describe the four memory allocation algorithms covered in lectures. Which two of the four are more commonly used in practice? (8 marks)