MACHAKOS UNIVERSITY

University Examinations for 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

DIPLOMA OF INFORMATION COMMUNICATION TECHNOLOGY

2920/105: OPERATING SYSTEM

DATE: 15/4/2019 **TIME: 8.30-11.30 AM**

INSTRUCTIONS

1. ***Answer Any five (5) questions***
2. ***All the questions carry twenty (20) marks each***
3. ***This paper consists of FOUR (4) printed pages***

QUESTION ONE (20 MARKS)

a) Explain the following with reference to inter-process communication;

i. Critical sections;

ii. Semaphore;

iii. Monitor;

iv. Message passing. (8 marks)

b) Using a well labeled process state diagram, show the transitions from one state to another (4 marks)

c) State **four** objectives of process scheduling (4 marks)

d) Distinguish between *preemptive and non-preemptive* scheduling policies (4 marks)

QUESTION TWO (20 MARKS)

a) The following series of processes with the given estimated run-times arrives in the READY queue in the order shown

Job	Arrival Time	Estimated run time
1	5	10
2	15	50
3	30	2
4	35	100
5	50	5

Assuming FCFS scheduling policy is used:-

i. Draw a Gannt chart showing order of execution.

ii. Calculate the wait-time/run-time ratio for each process

iii. Calculate Average Turn around time.

iv. Calculate the CPU utilization. (8 marks)

b) Describe the following terms in relation to operating systems;

i. Mutual exclusion;

ii. Race condition. (4 marks)

c) Describe **three** dynamic memory allocation techniques. (6 marks)

d) Define the term *process management*. (2 marks)

QUESTION THREE (20 MARKS)

a) Explain **four** conditions that must apply for a deadlock to take place in a computer system (8 marks)

b) Discuss **three** benefits of multiprogramming. (6 marks)

c) Explain the term *Swapping* as used in memory management. (2 marks)

d) State **four** functions of the operating system (4 marks)

QUESTION FOUR (20 MARKS)

a) Discuss the following memory management techniques

i. Contiguous allocation

ii. Non contiguous allocation (4 marks)

b) Distinguish between *command Language* and *Job control Languages* (4 marks)

c) Describe the use of *semaphores* in management of concurrent process (4 marks)

d) Define the term deadlock as used in operating systems giving an example (4 marks)

e) State **four** ways of preventing deadlocks (4 marks)

QUESTION FIVE (20 MARKS)

a) Explain the following terms in relation to deadlocks:

i. Two phase locking

ii. Starvation

iii. Safe and unsafe states (6 marks)

b) Explain the following terms as used in operating systems

i. Process

ii. Through put

iii. Turn around time (8 marks)

c) Discuss any **two** roles played by operating system while implementing the following functions associated with computer based systems.

i. Programs and subroutines loading (2 marks)

ii. Processor Management (2 marks)

iii. Main Memory Management (2 marks)

QUESTION SIX (20 MARKS)

a) Study the following algorithm of concurrent memory requests by two processes and answer the questions that follow

Time	*process 1*	*process 2*
T1	No request	No request
T2	Request and hold 80 kb	Request and hold 70kb
T3	No request	No request
T4	Request 110kb	Request 120kb

Assuming a total of 250kb is available for allocation:

i. Identify the most probable time at which a deadlock may occur. Justify your answer (4 marks)

ii. Suggest two ways of avoiding the deadlock (4 marks)

b) Describe the following types of process scheduling algorithms.

i. Round Robin;

ii. Priority;

iii. Shortest Remaining Time Next;

iv. Multi level queue. (12 marks)

QUESTION SEVEN (20 MARKS)

a) The table below shows the arrival time and required CPU burst time for three processes. Use it to answer the questions that follow

process	Arrival time (ms)	CPU burst (ms)
A	0	8
B	1	5
C	4	1
D	5	3

Assuming that the operating system uses SRTN algorithm

i. Draw a Gantt chart to show the order of executions

ii. Calculate Average waiting time

iii. Calculate Average turnaround time (8 marks)

b) With reference to variable partition, discuss any **two** techniques which can be employed by Operating System to handle external Fragmentation. (4 marks)

c) Outline **four** ways in which external devices mainly differ in reference to device management (4 marks)

d) Assuming a 2 kb page size and the virtual page 2 is mapped onto the physical page frame 4, identify the physical address which will be accessed when a program tries to access address 5002. (4 marks)

QUESTION EIGHT (20 MARKS)

a) Explain the term multiprogramming? (3 marks)

b) Define a process scheduler? (2 marks)

c) The schemes used to achieve virtual memory management are pagination, segmentation and overlay. Discuss each technique with the aid of diagrams. (15 marks)