MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2013/2014
DEPARTMENT OF COMPUTING AND APPLIED SCIENCES
End of Term Examination for Diploma in Information and Communication Technology
Module I
Operating Systems

Date: 24th March, 2014 **Time:** 2.00p.m. – 4.00 p.m.

Instructions
*Answer any **five** questions*

Question 1

a. Explain each of the following with reference to inter-process communication:
   i. Critical sections
   ii. Monitor
   iii. Busy waiting
   iv. Kernel
   v. Mutex
   vi. Message passing (12 marks)

b. With the aid of a diagram, describe the three-state process transitions as applied in process management. (6 marks)

c. State **four** objectives of process management. (2 marks)

Question 2

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

Process	Arrival time	Estimated run time
A	0	10
B	1	50
C	3	2
D	4	100
E	7	5

Assuming FCFS and SJF scheduling policies are used, for each policy:-
   i. Draw a Gantt chart to show the order of executions.
   ii. Calculate the waiting time for each process.

iii. Calculate the wait-time/run-time ratio for each process.
iv. Calculate the average turn around time.
v. Identify **one** disadvantage of each of the policies (14 marks)

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

Question 3

a. A group of ICT module 1 students in Machakos University College were carrying out an assignment about causes of process termination in operating systems. Explain **four** possible causes they my have written in their report. (8 marks)
b. Describe **three** benefits of multiprogramming. (6 marks)
c. Explain the term *swapping* as used in memory management. (2 marks)
d. State **four** functions of an operating system. (4 marks)

Question 4

a. Describe 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. (2 marks)
d. Define the term *virtual machine* as used in operating systems. (2 marks)
e. Explain **four** strategies of preventing deadlocks in computer systems. (8 marks)

Question 5

a. Explain the following terms with reference to process management as used in operating systems:
   i. Thread
   ii. Process
   iii. Through put
   iv. Turn around time
   v. Response time (10 marks)
b. Explain the following types of operating systems:
   i. Server operating systems
   ii. Embedded operating systems
   iii. Multiprocessor operating systems
   iv. Network operating systems (8 marks)
c. Outline **two** characteristics of the third generation operating systems. (2 marks)

Question 6

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 (2 marks)

ii. Suggest **two** ways of avoiding the deadlock. (2 marks)

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

b. Differentiate between *virtual* and *physical* memory addressing as used in operating systems. (4 marks)

c. Explain the *layered structure* of an operating system. (4 marks)

Question 7

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

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

c. Define the term *process management* as used in operating systems. (1 mark)

Question 8

a. With the aid of a diagram, describe the *memory hierarchy* in computer systems. (4 marks)

b. Explain the following terms in relation to deadlocks:

i. Two phase locking

ii. Starvation

iii. Safe and unsafe states (6 marks)

c. A system has four processes and five allocatable resources. The current allocation and maximum needs are as follows:

	Allocated	Maximum	Available
Process A	1 0 2 1 1	1 1 2 1 3	0 0 x 1 1
Process B	2 0 1 1 0	2 2 2 1 0	
Process C	1 1 0 1 0	2 1 3 1 0	
Process D	1 1 1 1 0	1 1 2 2 1	

Determine the smallest value of *x* for which this is a safe state? Show your working. (10 marks)