MACHAKOS UNIVERSITY

University Examinations for 2020/2021

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FIRST YEAR FIRST SEMESTER EXAMINATION FOR THE DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY

CODE 2920/105: OPERATING SYSTEMS

DATE:

Instructions:
Answer any FIVE questions
Don't write on this question paper

QUESTION ONE (20 MARKS)

a) Explain **two** circumstances under which a pre-emptive scheduling decision would be made by the operating system during inter-process communication. (4 marks)

b) Describe the term *virtual machine* as used in operating systems (2 marks)

c) Operating system employs a number of strategies to determine where to place incoming process. Critically discuss any **two** memory placement strategies that can be employed to achieve this. (4 marks)

d) ICT module 1 students in Machakos University were carrying out an assignment on objectives of memory management in operating systems. Explain **four** objectives that they could have mentioned. (4 marks)

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

f) Describe the term *roll-back* as used in process management. (2 marks)

QUESTION TWO (20 MARKS)

a) The efficiency of a system using *round robin scheduling* scheme is dependent on the size of the quantum. Explain why this is the case. (4 marks)

b) Paul, a module 1 student in a certain college was carrying out a term project which involved developing an interactive operating system. He decided to use preemptive scheduling algorithm. Explain **two** reasons that could have influenced his choice of this scheduling algorithm. (4 marks)

c) Explain **two** limitations of the above scheduling algorithm. (4 marks)

d) Describe where the following types of operating systems can be applied:
   a. *Real time*
   b. *Distributed* (4 marks)

e) Explain **two** objectives of process management as used in operating system.(4 marks)

QUESTION THREE (20 MARKS)

a) Differentiate between *kernel space and user space* as used in operating systems. (4 marks)

b) Derrick was required to investigate several elements of a process control block. With the aid of a diagram, outline **four** elements that he could have established. (4 marks)

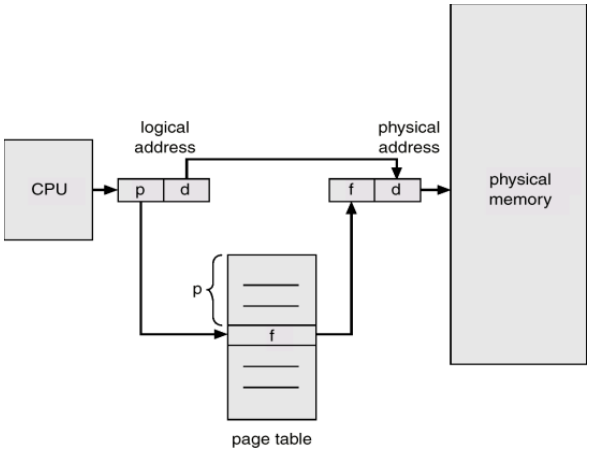
c) Describe the following types of process scheduling algorithms, giving an example in each case.
   a. Round Robin;
   b. Priority;
   c. Shortest Remaining Time Next;
   d. Multi-level queue. (12 marks)

QUESTION FOUR (20 MARKS)

a) Define the term spatial locality as used in operating systems. (2 marks)

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

c) The figure below shows a memory management technique. Use it to answer the questions that follow.



   a. Identify the memory allocation technique used justifying your answer. (2 marks)
   b. Explain the procedure that could be used to address the translation. (4 marks)
   c. Explain **two** benefits of the memory allocation technique identified in (a) above. (4 marks)

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

QUESTION FIVE (20 MARKS)

a) Describe the following strategies which can be employed to logically increase the size of main memory:
   i) Swapping
   ii) *Virtual memory* (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) 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	2	5
B	4	10
C	6	4
D	6	20
E	7	4

Assuming SJF scheduling policy is used:-

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 turnaround time;
v. Identify one disadvantage of the policy. (10 marks)

QUESTION SIX (20 MARKS)

a) Operating systems are designed to prevent deadlocks. Describe **three** ways in which they achieve this function. (6 marks)

b) Explain any **two** limitations associated with Shortest Job First scheduling algorithm. (4 marks)

c) Javesh Company Ltd. Would like to implement a client-server operating system. Describe **two** benefits the company will derive from this decision. (4 marks)

d) Explain the term *dispatcher* as used in operating systems. (2 marks)

e) Differentiate between *monolithic and non-monolithic* operating systems. (4 marks)

QUESTION SEVEN (20 MARKS)

a) Consider a swapping system in which memory consists of the following memory hole sizes in the following order: 10 KB, 4 KB, 20 KB, 18 KB, 7 KB. 9 KB, 12 KB, and 15 KB. Which hole is taken for successive segment requests of: 12 KB, 10 KB and 9 KB for:-first fit, best fit, worst fit, and next fit. (4 marks)

b) Stella was required to identify categories of memory management unit (MMU) in her computers operating system. Explain **two** categories that she could have identified. (4 marks)

c) Outline **four** advantages of a distributed operating system. (4 marks)

d) With the aid of a diagram, explain the layered structure of an operating system. (4 marks)

e) Explain the following types of operating systems:

iv. *Embedded operating systems;*

v. *Multiprocessor operating systems* (4 marks)

QUESTION EIGHT

a) A lecturer described the requirements for mutual exclusion during a lesson. Outline **four** requirements that he could have mentioned. (4 marks)

b) Outline **four** possible reasons for suspending a process during processing. (4 marks)

c) Describe **three** characteristics of the third generation operating systems. (6 marks)

d) Process synchronization is important during execution. Explain **three** methods employed by operating systems to achieve it. (6 marks)