MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FIRST YEAR SPECIAL / SUPPLEMENTARY EXAMINATIONS FOR

BACHELOR OF SCIENCE (COMPUTER SCIENCE)

SIT 121/SCO 107: OPERATING SYSTEM

DATE: 31/8/2022   **TIME: 8.30-10.30 AM**

INSTRUCTIONS:

ANSWER QUESTION ONE AND ANY OTHER TWO

QUESTION ONE (30 MARKS)

a)   Define the following terminologies as used with Operating system   (5 Marks)

      i.   Process,

      ii.   Process state,

      iii.   Dispatcher,

      iv.   Dispatch latency,

      v.   Interrupt

b)   Explain any THREE conditions in which CPU scheduling decisions may take place in a process   (3 marks)

c)   Briefly explain any FOUR scheduling criteria in a process   (4 marks)

d)   Using First-Come, First-Served (FCFS) Scheduling algorithm, calculate average waiting time for the processes   (3 marks)

Process	Burst Time *(milliseconds)*
P_1	24
P_2	3
P_3	3

Suppose that the processes arrive in the order: P_1 , P_2 , P_3

e) Explain any TWO ways operating system uses to authenticate users (4 marks)

f) State TWO advantages and TWO disadvantages of demand paging as used in operating system virtual memory. (4 marks)

g) Explain services provided by Kernel I/O subsystems in relation to operating system I/O software (4 marks)

h) Explain the following terminologies as used with operating systems (3 marks)

    i. Pooling

    ii. Direct memory access(DMA)

    iii. Program status register

QUESTION TWO (20 MARKS).

a) 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)

b) Describe any **three** reasons that would cause an executing process to terminate. (6 marks)

c) Explain how priority scheduling algorithm deals with the problem of starvation on processes with lower priority. (2 marks)

d) Suppose we have 4 processes that arrived in the order P3, P1, P4 and P2 and their burst times is as provided.

Process	Arrival Time	Burst Time
P1	0	5
P2	2	8
P3	3	4
P4	4	1

Considering the First Come First Served (FCFS) scheduling algorithm,

    i. Draw the Ghant chart; (2 marks)

    ii. Calculate the average waiting time for the processes; (2 marks)

    iii. Calculate the average turn around time. (2 marks)

QUESTION THREE (20 MARKS)

a) With the help of a diagram, explain the various process states.   (8 marks)

b) 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)

c) Priority scheduling algorithm is both pre-emptive and non-pre-emptive. Explain how this is achieved.   (4 marks)

d) using Round Robin scheduling criteria with time quantum = 20, draw a Gantt chart and calculate the average waiting time for the processes   (4 marks)

Process	Burst Time	Waiting Time of each Process
P_1	53	
P_2	17	
P_3	63	
P_4	26	

QUESTION FOUR (20 MARKS)

a) Use the process scheduling table below to calculate average waiting time using the algorithms below   (10 marks)

Process	Arrival Time	Execute Time	Priority	Service Time
P0	0	5	1	9
P1	1	3	2	6
P2	2	8	1	14
P3	3	6	3	0

   i.   FCFS
   ii.   SJN
   iii. Priority Scheduling

b) Explain the following terminologies as used with operating system memory management
   i.   Segmentation
   ii.   Paging
   iii. Fragmentation
   iv.   Memory allocation
   v.   Swapping   (10 marks)

QUESTION FIVE (20 MARKS)

a)   Critically discuss any three-page replacement techniques used by operating system to determine which page needs to be allocated.   (6 marks)

b)   Each process which is executing in a system is represented by operating system using the Process Control Block (PCB). Discuss three major contents found in the PCB and their role.   (6 marks)

c)   Critically discuss how the Round Robin (RR) scheduling algorithm works.   (8 marks)