



FACULTY	ENGINEERING AND INFORMATION TECHNOLOGY		
DEPARTMENT	ELECTRICAL AND COMPUTER ENGINEERING		
SUBJECT	OPERATING SYSTEM		
SUBJECT CODE	TCME 3792		
DATE	NOVEMBER 2023		
DURATION	3 HOURS	MARKS	100

FIRST OPPORTUNITY EXAMINATION

Examiner: DR. J. A. ADEBISI

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External Moderator: PROF JAMES AGAJO

This question consists of 2 pages excluding this front page.

Instructions

1. Answer **ALL FOUR** questions.
2. The marks allocation for each question are shown
3. Marks for different sections are shown on the right-hand margin
4. Begin each question on a new page
5. Clearly show your calculations and sketch good label diagrams where required.

Question 1: [25 Marks]

- (a) You want to configure an operating system for a group of young engineering entrepreneurs that runs products engineered and optimized to improve the efficiency of controlling hardware resources, drive very high graphical processes and decrease response time for the tasks to be performed by their solutions and devices. **[10 Marks]**

(i) What are some of the characteristics of your configuration? List Five (5).

(ii) List at least five (5) devices that might include the operating system you are to configure.

- (b) An Intelligence Agency developed a missile tracking application that is hosted on a Monolithic Operating System. The Intelligence agency required a detailed illustration to be successful in this application. Use your knowledge of operating system to illustrate this type of Operating system using diagram ONLY. **[5 Marks]**

- (c) You recently conceived an idea to develop a game imitating some playful experiences for a typical Namibia child including cultural educational awareness at tender age. The game to be deployed must be handheld and accessible globally within and outside Namibia so that gamers are connecting to the game with their personal phones over the Internet.

(i) Which operating system will you be using to develop this game? **[2 Marks]**

(ii) Describe your answer in (i) above. **[1 Marks]**

(iii) Draw the architecture of the operating system being used for the game development. **[4 Marks]**

(iv) Briefly describe 3 Popular platforms of the operating system you will be using. **[3 Marks]**

Question 2: [25 Marks]

- (a) Johannes is a newly employed system administrator with a mine in USAKOS, the mine has a number of applications that have large workloads and are heavily dependent on other systems for resource sharing and consumption. The mines management would like to manage space and reduce cost to enable them expand the existing resource on a single computer rather than actual, to focus on a single infrastructure without worrying about additional energy consumption and time to deploy. Jahannes have been asked to identify a suitable solution and service that is more reliable, easily managed and compatible with different operating systems.

(i) Describe the activity required of Johannes to professionally approach this challenge. **[2 Marks]**

(ii) List at least three (3) best applications that can be used to achieve your answer in (i). **[2 Marks]**

(iii) State at least three (3) advantages of the required activity and three (3) shortcomings that are likely to affect the organisation during this implementation. **[6 Marks]**

- (b) Differentiate between the following, In a tabular form **[10 Marks]**

1) Long-term scheduler and short-term scheduler (*At least three differences*)

2) Preemptive and non-preemptive scheduling (*Only on difference*)

- (c) You are the team lead of a group of 10 developers. You provided each developer with an individual PC with appropriate operating system to work on a Cloud Project that they can use as their personal sandbox to experiment with different cloud solutions. Developers has notified you of challenges of one developer process blocking the other while recording a long wait trying to access required resources held by another process. How can you prevent the occurrence of this situation? **[5 Marks]**

Question 3: [25 Marks]

- (a) Explain Linux Distros. **[5 Marks]**
- (b) Write a pseudocode for the lock variable synchronization mechanism in deadlocks. **[5 Marks]**
- (c) You currently secured an opportunity with Okay foods Windhoek. Coincidentally new servers are just being bought for management of customer orders which requires a combination of disk arrays configurations.
- (i) As a graduate being taught operating system, which Operating system feature is required to configure these servers. **[3 Marks]**
 - (ii) What type of configuration stated in your answer in (i) above will be suitable for Okay Foods **[3 Marks]**
 - (iii) Describe RAID level 10 and support your answer with appropriate diagram. **[4 Marks]**
- (d) If there are 100 units of resource R in the system and each process in the system requires 4 units of resource R, then how many processes can be present at maximum so that no deadlock will occur? **[5 Marks]**

Question 4: [25 Marks]

- (a) Find the average waiting time and the average turnaround time for executing the following processes using round-robin algorithm, where the quantum is 5. **[10 Marks]**

Process	P1	P2	P3	P4	P5
Burst Time	11	4	14	9	21
Arrival time	5	0	0	1	2

- (b) Explain the following terms with respect to Operating Systems. **[10 Marks]**
- (i) System calls
 - (ii) Swap Space Management
 - (iii) Thrashing
 - (iv) Shortest Remaining Time First (SRTF) Scheduling Algorithm
 - (v) Convoy effects in process scheduling.
- (c) Calculate the number of bits required in the address for memory having size of 16 GB. Assume the memory is 4-byte addressable. **[5 Marks]**