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University Examinations 2024/2025

SECOND YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE BACHELOR OF BUSINESS INFORMATION TECHNOLOGY, BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY, BACHELOR OF EDUCATION ARTS, BACHELOR OF EDUCATION SCIENCE, BACHELOR OF SCIENCE IN DATA SCIENCE, BACHELOR OF SCIENCE IN COMPUTER SCIENCE, BACHELOR OF SCIENCE IN COMPUTER TECHNOLOGY, BACHELOR OF SCIENCE IN COMPUTER SECURITY AND FORENSICS, BACHELOR OF SCIENCE IN MATHEMATICS AND COMPUTER SCIENCE, BACHELOR OF SCIENCE IN MATHEMATICS

CIT 3200: OPERATING SYSTEMS/OPERATING SYSTEMS I

DATE: JANUARY 2025 **TIME: 2 HOURS**

INSTRUCTIONS: *Answer question **one** and any other **two** questions*

QUESTION ONE (30 MARKS)

a. State four goals /objectives of Input Output Device management [4 marks]

b. Define the following terms as used in operating systems [6 Marks]

   i. Turnaround time

   ii. Cycle stealing

   iii. Busy waiting

c. Differentiate between the following terms as used in Operating systems [6 Marks]

   i. Internal fragmentation and external fragmentation

ii. TUI and GUI

iii. Dead lock and Live lock

d. Explain the procedure for accessing properties of a file in a computer [4 Marks]

e. Explain three ways of implementing one-time password in a computer system (6 marks)

f. With the aid of a well labelled diagram, explain the relationship between users, application programs, operating system and hardware [4 Marks]

QUESTION TWO (20 MARKS)

With the aid of a well labelled diagram explain the five state process model [6 Marks]

Consider a system with five processes **(P0, PI, P2, P3 and P4)** and four resource types **(RI, R2, R3, R4).**

Process	Allocation				Max				Available			
	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4
P0	2	0	1	1	4	1	3	2	2	1	1	1
P1	1	1	2	1	3	2	2	2				
P2	3	0	0	2	3	2	1	3				
P3	0	2	1	0	1	3	2	1				
P4	2	3	1	2	4	4	2	3				

You are required to:

a. Calculate the need matrix for each process [3 Marks]

b. Determine if the system is in a safe state [5 Marks]

c. IfP2 makes a request for (1, 0, 1, 0) resources, can the request be granted immediately? Justify your answer [3 Marks]

d. If P4 makes a request for (2, 1, 0, 1) resources, can the request be granted immediately? Justify your answer [3 Marks]

QUESTION THREE (20 MARKS)

a) Explain the procedure for viewing threads in a computer system [5 Marks]

b) Explain three file structures used in an operating system environment [6 Marks]

c) Below is a set of processes available for execution in a programmed environment

Process	Burst time	Arrival time
1	10	0
2	6	1
3	2	2
4	4	3
5	9	6

d) Using Highest Response Ratio Next, construct a Gantt chart. (Show all your working) [6 Marks]

e) calculate the average wait time [3 Marks]

QUESTION FOUR (20 MARKS)

a. Explain the following program threats [6 Marks]

i. Trojan horse

ii. Trap door

iii. Logic bomb

b. Discuss any two requirements that a solution to the critical section problem must satisfy. [4 Marks]

c. Consider a page reference string 7,0, 1 ,2,0,3,0,4,2,3,0,3,2 and 4 page slots. Using Least Recently Used (LRU) page replacement Algorithm. You are required to:

i. Represent the pages in memory [6 Marks]

ii. Calculate the number of page faults. [4 Marks]

QUESTION FIVE (20 MARKS)

a. Differentiate between pre-emptible and non-pre-emptible resources [2 Marks]

b. With the aid of a well labelled diagram explain the concept of Direct Memory Access (DMA) with respect to I/O device management [9 Marks]

c. A system has four processes (P1, P2, P3 and P4) and three resource types (R1, R2, R3).

RI has 2 instances,

R2 has 3 instances,

R3 has 2 instances.

The current state of the system is as follows:

- PI is holding I instance of RI and waiting for 1 instance of R2.
- P2 is holding 1 instance of R2 and waiting for 1 instance ofR3.
- P3 is holding I instance of R3 and waiting for 1 instance of RI.
- P4 is holding 1 instance of RI and 1 instance of R3, and waiting for 1 instance ofR2.

You are required to:

i. Draw the Resource Allocation Graph (RAG) representing the current system state. [7 Marks]

ii. Explain whether the system is in a deadlock state or not. Justify your answer. [2 Marks]