

The Open University of Sri Lanka
 B.Sc. Degree Programme: LEVEL 04/05
 Department of Computer Science
 Final Examination 2025/2026
CSU4300 / CSU5315– OPERATING SYSTEMS
DURATION: Two Hours (2 hours)



Date: 03/12/2025

Time: 1.30 pm – 3.30 pm

Answer **FOUR** Questions **Only**

QUESTION 1

- 1.1) List **three** (3) objectives of an operating system
- 1.2) Explain *time sharing system*.
- 1.3) List **five** (5) major activities of an operating system related to process management.
- 1.4) Describe **three** (3) services provided under systems view in an operating system.
- 1.5) A disk has 10 tracks on it. Tracks are numbered from 1 to 10 from the track near the spindle of the disk. Seek time across tracks is calculated according to the formula $2n+5$ ms where n is the track number. The disk has 1000MB file stored and data is equally distributed across tracks. Assume 1 seek and additional 50ms is needed to read 100 MB of data after seeking to the location of data. Calculate time required to read entire 1000MB file from the said disk.

QUESTION 2

- 2.1) Systems that manage processes must be able to perform certain operations on the processes. List **seven** (7) such operations.
- 2.2) Consider a system with one CPU and six jobs, Each job has arrival time and burst time as given below.

Job	Arrival Time	Burst Time
1	0	9
2	2	5
3	4	2
4	6	3
5	9	1
6	10	2

- (i) Draw separate Gantt charts illustrating the above jobs using **Non pre-emptive SJF, Pre-emptive SJF and Round Robin (time quanta = 3)** scheduling algorithms.
- (ii) Compute the *average turn around time*, *average waiting time* and *average response time* for above jobs using **pre-emptive SJF algorithm**. Show all the calculations.

QUESTION 3

- 3.1) What are the four (4) reasons to have cooperating processes in an operating system ?
- 3.2) Write an algorithm to solve *producer/consumer problem with bounded buffer*.
- 3.3) Compare *kernel level* and *user level* threads.
- 3.4) What is *thread join* ? describe using an example.
- 3.5) Matrix A(10x8) and matrix B(8x12) need to be multiplied using a 8 core CPU supporting 4 threads per core. Assuming 5ms is needed per parallel multiplication operation, calculate the time required in milliseconds to do the entire matrix multiplication.

QUESTION 4

- 4.1) What is *coalescing* operation in memory management?
- 4.2) List **two** (2) free memory management schemes.
- 4.3) Suppose you have the following page reference string and the frames (0,1,2).

Reference string	1	2	2	3	2	4	4	1	3	1	2	5	3	5	5	6
Frame 0																
Frame 1																
Frame 2																

Use the table above to show frame allocation using the FIFO algorithm. Mark the frame replacement locations using *. (Hint: draw this table in your answer script and fill the blanks)

- 4.4) Assume that the operating system on your computer uses the buddy system for memory management. Initially the system has 8192 KB of memory, which begins at address 0. Show the result of each request/release given below via successive figures.
 1. A: Request 250KB
 2. B: Request 300KB
 3. C: Request 120KB
 4. D: Request 60KB
 5. Release A
 6. E: Request 150KB
 7. Release B
 8. F: Request 80 KB
 9. Release C
 10. Release D
 11. Release E
 12. Release F
- 4.5) Assuming that the system given in above question 4.4 has only completed up to the memory request of F, compute the amount of internal fragmentation that exists in the system at that time.

QUESTION 5

- 5.1) Draw a diagram to show memory address translation with paging in an operating system
- 5.2) List all techniques of recovering from a deadlock.
- 5.3) In a system, there is a total of 25 units of resource R1, 18 units of resource R2 and 16 units of resource R3. The system is in the following state (S0).

Process	Max			Allocation		
	R1	R2	R3	R1	R2	R3
P0	8	7	3	3	4	3
P1	12	9	6	8	5	4
P2	6	7	4	6	3	2
P3	11	5	6	5	2	3

- (i) Show that the above state (S0) is a safe state. Give the complete sequence of jobs.
- (ii) The process P1 requests for the resources (R1, R2, R3) equivalent to units (1, 0, 1) when the system is in state S0. Is it possible to grant the request by P1? Give the process sequence.

QUESTION 6

- 6.1) Permission numbers of files pasan.txt and nimal.txt are given as 753, 643 respectively.
- (i) Explain the permissions of those files in terms of owner, group and others.
- (ii) Which file has the most permissions for the owner?
- 6.2) Draw a diagram to show *linked allocation* of a disk space using an example.
- 6.3) What are the four (4) steps used in transfer of each byte under the transfer mode programmed input output (PIO).
- 6.4) Draw diagrams to describe the functionality of the following disk access scheduling schemes in a disk having 0-999 cylinders. Previous and current head positions are 300 and 200 respectively. The read request sequence is 350, 240, 400, 50, 180, 550, 750. Then calculate the distance traveled by disk head in each of the scheduling algorithm given below from the current head position.
- (i) C-SCAN
- (ii) C-LOOK
- (iii) LOOK
- (iv) SSTF