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00373

The Open University of Sri Lanka
Faculty of Natural Sciences
B.Sc/ B. Ed Degree Programme

Department	: Computer Science
Level	: 4/5
Name of the Examination	: Final Examination
Course Title and - Code	: **CSU4300/CSU5315 – Operating Systems**
Academic Year	: **2020/21**
Date	: **29/12/2021**
Time	: **9.30 am – 11.30 am**
Duration	: **2 hrs**

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **(6)** questions in **(3)** pages.
3. Answer any **four (4)** questions only. All questions carry equal marks.
4. Answer for each question should commence from a new page.
5. Draw fully labeled diagrams where necessary
6. Involvement in any activity that is considered as an exam offense will lead to punishment
7. Use blue or black ink to answer the questions.
8. Clearly state your index number in your answer script

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

QUESTION 1

1.1) List three (3) types of services available in an Operating system.

1.2) Name two (2) kernel types in an operating system and describe the differences between those two kernel types.

1.3) Draw a diagram showing the abstrations of computer system components of an operating system.

1.4) List **five** (5) major activities of an operating system in regard to file management.

1.5) A disk has 10 tracks in it. The seek time in a track near the spindle of the disk is 10ms while the seek time near perimeter of the disk is 100ms. Seek time has a linear increase across tracks. The disk has 100MB file stored and data is equally distributed across tracks. Assume 1 seek and 1ms is needed to read 1 MB of data after seeking to the location of data. Calculate time required to read entire 100MB file from the said disk.

QUESTION 2

2.1) Briefly explain four (4) methods that a process may terminate.

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	7
2	2	5
3	5	1
4	6	1
5	9	6
6	11	2

(i) Draw separate Gantt charts illustrating the above jobs Using **Non pre-emptive SJF, Pre-emptive SJF and Round Robin (time quanta = 2)** 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 the calculations.

QUESTION 3

3.1) What is a *cooperative process* in an operating system ?

3.2) List a scheme/mechanism to achieve mutual exclusion.

3.3) What is a semaphore ? Explain the functionality of two atomic functions P and V in a semaphore

3.4) Write an algorithm (c like code) to solve the *Dining Philosopher problem using semaphore.*

QUESTION 4

4.1) Draw a suitable block diagram to show *address translation with TLB* in memory management.

4.2) Suppose you have the following page reference string and the frames (0,1,2).

Reference string	2	3	5	4	3	1	3	1	2	1	4	6	5	6	7	8
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)

4.3) Assume that the operating system on your computer uses the buddy system for memory management. Initially the system has 4096KB of memory, which begins at address 0. Show the result of each request/release given below via successive figures.

A: Request 400KB
B: Request 350KB
C: Request 115KB
D: Request 135KB
Release A
E: Request 425KB
Release B
F: Request 109 KB
Release C
Release D
Release E
Release F

4.4) Assuming that the system given in 4.3 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 **two** (2) block diagrams to show thread execution of a single thread and three threads.

5.2) Lst **four** (4) necessary conditions for a deadlock to occur.

5.3) List the **two** (2) methods of handling a deadlock?

5.4) In a System, there is a total of 22 units of resource R1, 18 units of resource R2 and 14 units of resource R3. The system is in the following state (S0).

Process	Max			Allocation		
	R1	R2	R3	R1	R2	R3
P0	6	6	5	4	4	2
P1	9	8	6	7	5	1
P2	6	7	3	5	1	2
P3	8	5	3	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 (0, 0, 4) 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 saman.txt and kamal.txt are given as 761, 653 respectively.

(i) Explain the permissions of those files in terms of owner, group and others.

(ii) Which file has most permissions for the owner ?

6.2) Draw a diagram to show index allocation of a disk space using an example.

6.3) 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 345 and 100 respectively. The read request sequence is 420,230,500,45,160,685.700. Then calculate the distance traveled by disk head in each of the scheduling algorithm given below from the current head position.

(i) SCAN
(ii) C-LOOK
(iii) SSTF