School of Computing
Third CIA Exam – April 2024
Course Code: CSE308
Course Name: Operating Systems
Duration: 90 minutes
Max Marks: 50

PART - A

Answer all the questions **5 X 2 = 10**

1. How does an interrupt differ from a trap?
   Trap is triggered by a user program to invoke OS functionality. **I**nterrupt is triggered by a hardware device to allow the processor to execute the corresponding interrupt handler routine.

2. A process executes the following code.
   for (i = 0; i < n; i++) fork ();
   How many child processes are created?
   Total Children = 2^n -1

3. Name two hardware instructions and their definitions that can be used for implementing mutual exclusion.
   A. Test and set B. Compare and Swap

4. How the problem of external fragmentation can be solved?
   External Fragmentation can be reduced by compaction or shuffle memory contents to place all free memory together in one large block.

5. Calculate the number of pages for the process of size 72,766 bytes and the page size is 2,048 bytes. Does internal fragment occur? If yes, how? If no, why?
   If the page size is 2,048 bytes, a process of 72,766 bytes will need 35 pages plus 1,086 bytes (1 marks). It will be allocated 36 frames, resulting in internal fragmentation of 2,048 - 1,086 = 962 bytes.

PART - B

Answer Any Three Questions **3 X 10 = 30**

6. Consider the following set of processes, whose arrival and execution time, is given below.

Process	Arrival Time	Exec. Time
P1	0.0	7
P2	2.0	4
P3	4.0	1
P4	5.0	4

(a) With pre-emptive SJF algorithm find average waiting time and average turnaround time. (4)
(b) With Round Robin algorithm [Time Quantum=2] average waiting time and average turnaround time. (4)
(c) Compare two algorithms and conclude which one is best and why? (2)

A. SJF(PREEMPTIVE) (4 marks)
Avg waiting Time= (9 + 1 + 0 + 2)/4 = 3
Turnaround time= 16+15+1+6/4=28/4=7
B. RR (4 marks)
Avg waiting Time= 18.4/4=4.5
Turnaround time=34/4=8.5
C. Comparison (2 marks)

7. Given page reference string: 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6 with four frames. Compare the number of page faults for LRU and Optimal page replacement algorithm.

LRU: Number of page faults is 10 and Optimal Replacement Algorithm Page fault is 8.

8. Discuss : Segmentation.

- Diagram (3)
- Explanation about Logical view of segmentation, segmentation hardware (7)

9. With neat diagram, explain three major methods of allocating disk space (10)

An allocation method refers to how disk blocks are allocated for files.

Explanation of the following allocation methods with diagram

- Contiguous allocation
- Linked allocation
- Indexed allocation

PART – C

Answer the following Question **1 X 10 = 10**

10. a) Assume a disk with 200 tracks numbered 0 to 199. Initially the read/write head is on 100. The queue of the pending request is kept in the order 55, 58, 39, 18, 90, 160, 150, 38 and 184. With diagram showing the head movement calculate the average seek length for the following disk scheduling algorithm.

i) FIFO ii) SSTF iii) C-SCAN

Diagram (4 Marks)

Ans: FIFO: 55.3; SSTF: 27.5; C-SCAN: 43.11 (6 Marks)