2022

COMPUTER SCIENCE — HONOURS

Paper : CC-7

(Operating Systems)

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words
as far as practicable.

Answer **question no. 1** and **any four** questions from the rest.

1. Answer **any five** questions :   2×5

   (a) Differentiate between multiprogramming and multiprocessing.

   (b) What is the functionality of fork( ) system call?

   (c) Mention the use of Medium-term scheduler.

   (d) What is context-switching?

   (e) Differentiate between preemptive and non-preemptive process scheduling.

   (f) Why is 'aging' performed?

   (g) Explain the functionality of spooling.

   (h) State any two functions of dispatcher.

2. (a) Consider the following table :

Process	Arrival Time	Burst Time (ms)
P₁	0	10
P₂	0	8
P₃	2	7
P₄	5	3
P₅	11	1

   (i) If the CPU scheduling is SJF with preemption, what would be the average waiting time and average turnaround time?

   (ii) If the CPU scheduling is round-robin with time quantum of 3 ms, what would be the average waiting time and the average turnaround time?

   (b) What is starvation? Name two scheduling schemes that suffer from the problem of starvation.

   (3+3)+(2+2)

Please Turn Over

3. (a) What is a 'safe state'? How does the Banker's algorithm ensure that a system is in a safe state? Explain briefly.

(b) Consider the following snapshot of a system :

Process No.	Allocation A B C	Max A B C	Available A B C
P₀	0 1 0	7 5 3	3 3 2
P₁	2 0 0	3 2 2	
P₂	3 0 2	9 0 2	
P₃	2 1 1	2 2 2	
P₄	0 0 2	4 3 3	

Answer the following questions using Banker's algorithm :

(i) What is the content of the need matrix?

(ii) Is the system in a safe state? (2+2)+(4+2)

4. (a) What is the dining philosophers problem? How is it related to the critical section problem?

(b) What are the conditions that a solution to the critical section must satisfy?

(c) How will you solve the Producer-Consumer problem using system calls? (2+1)+3+4

5. (a) What do you understand by demand paging?

(b) Given references to the following pages by a process :

0, 1, 4, 2, 0, 4, 3, 5, 1, 6, 3, 2, 3, 2, 6, 2, 1, 3, 4, 2, 1, 0.

Find the number of page faults if the process has 3 page frames available to it, using both LRU and Optimal page replacement. 2+(4+4)

6. (a) Explain the difference between physical and logical address.

(b) Suppose the memory is partitioned into 5 blocks of 100 KB, 500 KB, 200 KB, 300 KB and 600 KB. How would the first-fit, best-fit, worst-fit algorithms place processes of 212 KB, 417 KB, 112 KB and 426 KB (in that order)?

(c) When does external fragmentation occur? How can you overcome this fragmentation? 2+6+2

7. (a) Define seek time and latency time.

(b) Why is seek optimisation more important than rotational optimization?

(c) Given the order of track requests below :

70, 140, 50, 125, 30, 25, 160 and the initial position of the R/W head is 60. Use the following algorithms to find the total seek time :

(i) FCFS (ii) SSTF. 2+2+(3+3)

8. (a) What are i-nodes? Mention two of its uses.

   (b) Mention the use of FAT.

   (c) Discuss some functionalities of the kernel.

   (d) What is the mechanism of interrupt I/O cycle?

   (2+1)+2+2+3

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