

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

- Differentiate between multiprogramming and multiprocessing.
- What is the functionality of fork( ) system call?
- Mention the use of Medium-term scheduler.
- What is context-switching?
- Differentiate between preemptive and non-preemptive process scheduling.
- Why is 'aging' performed?
- Explain the functionality of spooling.
- State any two functions of dispatcher.

2. (a) Consider the following table :

Process	Arrival Time	Burst Time (ms)
P <sub>1</sub>	0	10
P <sub>2</sub>	0	8
P <sub>3</sub>	2	7
P <sub>4</sub>	5	3
P <sub>5</sub>	11	1

- If the CPU scheduling is SJF with preemption, what would be the average waiting time and average turnaround time?
  - 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	Max	Available
	A B C	A B C	A B C
P <sub>0</sub>	0 1 0	7 5 3	3 3 2
P <sub>1</sub>	2 0 0	3 2 2	
P <sub>2</sub>	3 0 2	9 0 2	
P <sub>3</sub>	2 1 1	2 2 2	
P <sub>4</sub>	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)

(3)

*X(3rd Sm.)-Computer Sc.-H/CC-7/CBCS*

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?
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(2+1)+2+2+3