2020

COMPUTER SCIENCE — HONOURS

Paper : CC-7

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 Multiprogrammed Systems and Time Sharing Systems.

(b) What are page frames?

(c) Explain pre-emptive scheduling with an example.

(d) Describe the functions of long term schedule.

(e) What is PCB?

(f) Differentiate between logical address space and physical address space.

(g) What is Belady's anomaly?

(h) Give two benefits of threading.

2. (a) What is 'time quantum' in Round-Robin scheduling?

(b) Explain the five criteria based on which CPU scheduling algorithms are designed.

(c) Consider the following set of processes, with the length of the CPU-burst time given in milli seconds.

Process	Burst time
P_1	10
P_2	1
P_3	2
P_4	1
P_5	5

The processes are assumed to have arrived in the order P_1, P_2, P_3, P_4, P_5 all at time 0.

(i) Draw the Gantt chart illustrating the execution of these processes using RR (quantum = 1) scheduling.

(ii) Find average turnaround time. 2+5+(1+2)

3. (a) When does a 'race ground' condition occur?

(b) Give a solution to the critical section problem using a Lock Variable.

(c) What are the necessary conditions of deadlock? 2+4+4

4. (a) Write the Banker's safety algorithm.

(b) Consider the following snapshot of a system :

Process No.	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P_0	0	3	0	7	5	3	2	1	0
P_1	3	0	2	3	2	2			
P_2	3	0	2	9	0	2			
P_3	2	1	1	2	2	2			
P_4	0	0	2	4	3	3			

(i) Find the current need matrix.

(ii) Is the system in a safe state? 5+(2+3)

5. (a) Explain the following allocation algorithms.

(i) First-fit

(ii) Best-fit

(iii) Worst-fit

(b) Why is paging faster than segmentation?

(c) On a system using simple segmentation, compute the physical address for each of the logical addresses, given the following segment table. If the address generates a segment fault, indicate so.

Segment	Base	Length
0	1100	500
1	2500	1000
2	200	600
3	4000	1200

(i) 0, 300 (ii) 2, 800 (iii) 1, 600 (iv) 3, 1100 (2×3)+2+2

6. (a) What is thrashing?

(b) Apply LRU page replacement algorithm for the following page reference string. Find the number of page faults for three page frames.

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

(c) What is the working set of a program? How is it connected to the concept of locality? 2+5+3

7. On a disk with 1000 cylinders, numbers 0 to 999, compute the number of tracks the disk arm must move to satisfy all the requests in the disk queue. Assume the last request serviced was at track 345 and the head is moving toward track 0. The queue in FIFO order contains requests for the following tracks : 123, 874, 692, 475, 105, 376.

Perform the computation for the following scheduling algorithms.

(a) FIFO

(b) SSTF

(c) SCAN

(d) LOOK

(e) C-SCAN. 2×5

8. (a) Why do we need device drivers and device controllers?

(b) How does C-SCAN disk scheduling differ from its SCAN counterpart?

(c) What is the relationship between shell and kernel? Give two different categories of kernel. [(1½+1½)+3+(2+2)]