

2021

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) What is the dual-mode of the Operating System?
- (b) What is the purpose of PCB?
- (c) What is the role of medium-term scheduler?
- (d) What is 'spooling'?
- (e) Give two benefits of threading.
- (f) How are pages different from page frames?

2. Consider the following set of processes :

(a)	Process	Arrival Time	Burst Time
	P ₁	0	10
	P ₂	1	6
	P ₃	2	12
	P ₄	3	15

(i) Draw the Gantt chart illustrating the execution of these processes using Shortest-Job-First and Round Robin (Time quantum = 2) scheduling.

(ii) Compare their average turn around time and waiting time.

(b) What is starvation? Explain with suitable example.

(c) Illustrate the use of fork () and exec () system calls.

(2+3)+3+2

3. (a) What is the motivation behind using 'Multiple queue scheduling'? How is it improved by using 'Multi level feedback queue' scheduling?

(b) How is the 'wait-for' graph different from the 'resource allocation graph'?

(c) What is a 'spin lock'?

(2½+2½)+3+2

Please Turn Over

4. (a) Why does the sleep and wakeup system call pair do not manage to solve the critical section problem in a foolproof manner?
- (b) Consider a system consisting of 'm' resources of the same type being shared by 'n' processes. Resources can be requested and released by processes only one at a time. Show that the system is deadlock free, if the following two conditions hold :
- (i) The maximum need of each process is between 1 and m resources.
- (ii) The sum of all maximum needs is less than $m + n$.

Justify your answer logically.

$5+(2\frac{1}{2}+2\frac{1}{2})$

5. (a) What is the justification of having the concept of virtual memory?
- (b) What is the page fault rate and how is it connected to the system performance?
- (c) Consider a paging system with a TLB. Each memory reference takes 200ns, and each look up of the TLB takes 20ns. What is the effective memory reference time if 80% of page table references are found in the TLB?
- 3+(2+1)+4
6. (a) Consider the following page reference string :
- 1, 3, 2, 7, 2, 1, 4, 6, 2, 4, 2, 3, 7, 8, 3, 7, 4, 7, 3, 6.
- How many page faults will occur for 3 page frames for—
- (i) LRU and (ii) Optimal page replacement algorithm.
- (b) What is the 'buddy system' of memory allocation?
- (c) In direct paging system, each memory reference can turn into two or more memory references. Justify.
- (3+3)+2+2
7. (a) What is the difference between 'protection' and 'security' in an operating system? Explain in detail.
- (b) What is the 'bootstrap program'? Can a system exist without it? Justify your answer. $5+(2+3)$
8. (a) Why is disk scheduling necessary? Which is the time that is usually optimized with a greatest priority?
- (b) What is the Master Boot Record (MBR)? Explain its purpose.
- (c) Given the order of track requests below, use SSTF to service the requests and calculate the total seek time. Order of requests : 82, 170, 43, 140, 24, 16, 190
- Current position of R/W head : 50. $(2+1)+(2+1)+4$
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