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 Gnatt 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+(2½+2½)

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 greates 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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