

2021

## COMPUTER SCIENCE — HONOURS

Second Paper

(Group - A)

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 three** questions from the rest, taking **two** from **Section-I** and **one** from **Section-II**.1. Answer **any four** questions :

2×4

- State the difference between compiler and interpreter.
- Write two advantages of linked list over array.
- What do you mean by linear data structure? Give an example.
- What is a priority queue?
- What is the job of the CPU scheduler?
- What is a sparse matrix?
- Convert the following infix expression to its equivalent post fix form :  $(A + B) / C * D \wedge E / F$ . Show the steps.
- How is a polynomial represented using an array?

## SECTION - I

(System Software Fundamentals and Operating Systems)

- Distinguish between long-term and short-term schedules.
  - What is a dynamic loader and how does it function?
  - Consider a set of four processes with their arrival times and burst times given below :

| Process        | Burst Time (ns) | Arrival time (ns) |
|----------------|-----------------|-------------------|
| P <sub>1</sub> | 10              | 0                 |
| P <sub>2</sub> | 5               | 1                 |
| P <sub>3</sub> | 4               | 2                 |
| P <sub>4</sub> | 7               | 6                 |

Draw Gantt Chart for Round-Robin scheduling with time quantum of 2ns, and find out the average turnaround time and average waiting time. 3+5+(3+3)

Please Turn Over

3. (a) Differentiate between binary semaphore and counting semaphore. Explain how semaphores solve the bounded buffer problem.  
(b) Explain the concept of 'wait for' graph in deadlock detection.  
(c) Explain best fit and worst fit memory placement strategies with appropriate examples. (2+4)+4+4
4. (a) What is Translation Lookaside Buffer (TLB)? Why is it needed?  
(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  
Find the number of page faults if the process has 3 page frames available to it and page replacement algorithms are both (i) LRU and (ii) Optimal.  
(c) What is spooling? What is the problem associated with it? (2+2)+(3+3)+(2+2)
5. (a) Explain how external fragmentation affects performance of variable partition multiprogramming. What are the possible solutions?  
(b) Discuss briefly about SCAN disk scheduling and C-SCAN disk scheduling with suitable examples.  
(c) What is 'thrashing' and how is it caused? (2+3)+(3+3)+(2+1)

**SECTION - II****(Data Structure - I)**

6. (a) Write an algorithm to reverse the elements of an array using only one extra stack.  
(b) Write an algorithm to insert a node after a given node (containing 'ITEM'), in a singly linked list.  
(c) Write the properties of a recursive function. 5+5+4
7. (a) What do you mean by ADT? How does it differ from data structure?  
(b) Suppose a 3D-array A is declared using A(2:8, 1:4, 6:10). Find the number of elements in the array A. Also find the location of A[5] [6] [8] using row-major order.  
(c) Write an algorithm to find the middle element in linked list. Also illustrate the algorithm with the help of an example.  
(d) Write the queue FULL and EMPTY condition in case of circular queue. (2+2)+(1+2)+(3+2)+(1+1)
-