[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 1438 **F-7** **Your Roll No.....**

Unique Paper Code : 2341301

Name of the Paper : Operating Systems

Name of the Course : **B.Tech. Computer Science**

Semester : III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on the receipt of this question paper.
2. **Section A** is compulsory.
3. Attempt any **4** questions from **Section B.**

Section A

1. (a) Differentiate between a trap and an interrupt. (2)

   (b) Given an example of a system program explaining it's utility in an operating system. (2)

   (c) What is a process? How is it different from a program ? (2)

   (d) Which of the following components of program state are shared across threads in a multithreaded process ?

   (i) Register values

   (ii) Heap memory

   (iii) Global variables

   (iv) Stack memory (2)

P.T.O.

(e) (i) Explain round-robin scheduling algorithm for scheduling processes ? (2)

(ii) Which of the following operating systems use round-robin scheduling ? Justify.

(I) Real-time operating system.

(II) Time-shared operating system. (2)

(f) "Mutual Exclusion is a necessary condition for a deadlock to occur". Explain. (2)

(g) "The method contiguous memory allocation suffers from external fragmentation". Justify. (2)

(h) Define pure demand paging ? (2)

(i) Compare and contrast the sequential and direct access methods for files. (2)

(j) Discuss the single-level directory implementation. (2)

(k) Explain the linear list method for directory implementation. (2)

(l) Starvation cannot occur in the FCFS disk-scheduling algorithm. Explain why this assertion is true. (2)

(m) How can a Trojan horse be used to compromise the security of a system ? (2)

(n) Explain the masquerading method of attack used to breach security. (2)

(o) (i) Define the critical section problem. (2)

(ii) What are Semaphores ? How can they be used to solve the critical section problem ? (3)

SECTION B

2. (a) What are privileged instructions ? Give an example of a privileged instruction. In which mode of the operating system are they executed ? Justify your answer. (1+1+2)

(b) Enumerate the different states of a process and the causes of transition from one state to another ? (4)

(c) Of the following five forms of storage, rank them from fastest to slowest in terms of access time : (1) main memory, (2) magnetic disk, (3) registers, 4) solid state disk, (5) cache. (2)

3. Suppose the following processes arrive for execution at the time indicated :

Process	Burst Time
P0	5
P1	3
P2	2
P3	6
P4	1

(a) Draw Gantt charts illustrating the execution of these processes using FCFS, RR (time quantum = 3). (4)

(b) What is the turnaround time for process P0, P3 in FCFS ? (3)

(c) What is the waiting time for processes P1, P4 in RR ? (3)

4. (a) Given five memory partitions of 100 KB, 500 KB, 200 KB, 300 KB, and 600 KB (in order), how would the first-fit algorithm place processes of 212 KB, 417 KB, 112 KB, and 426 KB (in order) ? (4)

(b) Given the following reference string with four page frames

1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 5, 4, 2

How many page faults occur for

(i) Optimal algorithm

(ii) LRU algorithm (6)

5. (a) Explain the purpose of the open () and close () operations. (2)

(b) What are the advantages of the variant of linked allocation that uses a FAT to chain together the blocks of a file ? (3)

(c) Suppose that a disk drive has 1,000 cylinders, numbered 0 to 999. The drive is currently serving a request at cylinder 150, and the previous request was at cylinder 805. The queue of pending requests, in FIFO order, is :

69, 212, 296, 800, 44, 1,18, 356, 523, 965, 681

Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms ?

(i) SCAN

(ii) LOOK (5)

6. (a) What are deadlocks ? Is it possible to have a deadlock involving only a single process ? Explain. (4)

(b) Draw a resource allocation graph for the following –

P = {P1, P2, P3, P4}

R = {R1, R2, R3}

E = (P1->R1, R1-> P3, P2 -> R1, R2-> P2, R2-> P2, R3-> P2, P3-> R3, R2-> P4}

The number of instances of R1 and R3 is 1 and R2 is 2. Is there a cycle in the graph? Is the system in a deadlocked state? If not, then give reason. (6)