

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 1910 C Roll No.....

Unique Paper Code : 234401

Name of the Course : B.Sc. (H) Computer Sc.

Name of the Paper : Operating System (CSHT-408)

Semester : IV

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

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

SECTION – A

1. (a) Describe how CPU and memory are protected by the operating system. (4)
(b) What is the purpose of a command interpreter? Why is it usually separate from the kernel? (4)
(c) Describe the actions taken by kernel to context switch between processes. (3)

2. A system has 5 processes P1 through P5 and 3 resources R1, R2 and R3. It has 2 instances of each of the resources. Given that :

P1 requests 2 units of R2 and 1 unit of R1. It holds 1 unit of R3.

P2 holds 2 units of R1 and 1 unit of R2.

P3 holds 1 unit of R2 and request 2 units of R3.

P4 requests 1 unit of R1 and holds 1 unit of R1.

P5 holds 2 units of R2 and request 1 unit of R1.

Show the resource graph for the system. Is the system in deadlock state and if so which processes are involved ? (5)

3. Consider the following set of processes with the length of the CPU-burst time given in milliseconds : (3+6)

Process	Arrival time	Burst Time	Priority
P1	0	3	3
P2	4.2	2	1
P3	2.3	2	2
P4	1.2	4	4 (Highest)

- (a) Draw Gantt charts illustrating the execution of these processes using non preemptive priority, SJF (preemptive) and RR (quantum=2) scheduling.
- (b) What is the average waiting time and average turnaround time for each of the scheduling algorithms in part a ?
4. Suppose that a disk has 3,000 cylinders numbered 0 to 2999. The disk head is currently at cylinder 943 and previous request was at 1025. The queue of pending requests in FIFO order is :

86, 2470, 1913, 1077, 948, 1509, 130, 15, 500.

Calculate and show total head movements for the following disk scheduling algorithms :

- (a) SSTF
- (b) LOOK (4)
5. Given references to the following pages by a program

0, 9, 0, 1, 8, 1, 8, 7, 8, 7, 1, 2, 8, 2, 7, 8, 2, 8, 3

How many page faults will occur if the program has three page frames available to it and uses the following replacement techniques :

- (i) FIFO replacement (ii) LRU replacement (6)

SECTION – B

6. (a) What is the need for a separate system wide and per process open file table ? Describe the information present in both tables. (5)
- (b) What is a virtual machine ? What are the benefits of using virtual machine ? Draw its diagram. (5)
7. (a) Give the comparison between linked allocation method and indexed allocation method. (4)
- (b) What is a re-entrant code ? Why is it useful ? (3)
- (c) What are the advantages and disadvantages of tree structured directories ? (3)
8. (a) Assume that 5 memory partitions of 300kb, 200kb, 200kb, 400kb and 500kb are given. How would the first-fit, worst-fit, and best-fit store processes of 320kb, 450kb, 350kb, 420kb, 390kb in sequence ? Which algorithm makes the most efficient use of memory ? (5)
- (b) Explain any two techniques that implement free-space management. (5)
9. (a) Differentiate between : (4×2)
- (i) Kernel-level thread and User-level thread
- (ii) Message passing and Shared memory system of Inter-process Communication
- (b) Explain need-to-know principle. (2)

10. (a) Explain three requirements that must be satisfied for a solution to critical section problem. (3)
- (b) What are the criteria based on which we can compare various CPU scheduling algorithms ? (3)
- (c) What do you mean by program threats ? Explain any one program threat. (4)
11. (a) Explain four conditions which when hold simultaneously lead to a deadlock. (2)
- (b) What are the three ways to establish relationship between user threads and kernel threads ? (3)
- (c) Explain any one memory management scheme that permits the physical address space of a process to be non-contiguous. (5)