[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1402 **C**

Unique Paper Code : 32341302

Name of the Paper : Operating Systems

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

Semester : III

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. Attempt any **4** questions from **Section B**.
3. Parts of a question must be answered together.

SECTION A

1. (i) Which algorithm is the preemptive version of First in First out CPU scheduling algorithm? (1)

(ii) What is the name given to the section of code or set of operations in which process is working on its shared variables? (1)

P.T.O.

(iii) What is 'Dirty bit' in Demand paging? Where this bit is stored by the Operating System? (2)

(iv) Why command interpreter is usually placed separate from the kernel? (2)

(v) Write any two problems that may occur in multiprogramming environment? (2)

(vi) How degree of multiprogramming affects CPU performance? (2)

(vii) Explain the type of fragmentation that occurs in segmentation? (2)

(viii) Using semaphores, how can we achieve the condition of having statement 'a' of process P1 to be executed only after 'b' condition of process P2. (2)

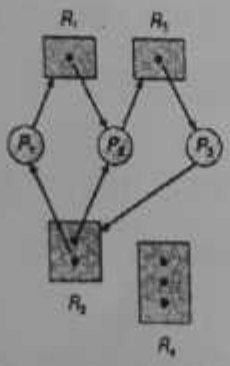
(ix) List any two privileged instructions? (2)

(x) What is the significance of two separate modes of operation in operating systems? (2)

(xi) Which are the two conditions under which a parent may terminate the execution of one of its children? (2)

(xii) Write the bit vector representation for free space list for a disk (10 blocks) where blocks 1, 2 and 5 are free and rest of the blocks are allocated. Give one advantage of this representation. (2)

(xiii) Determine whether the deadlock occur in the given resource 3 allocation graph of three processes as P_1, P_2 and P_3 and four resources as R_1 (one instance), R_2 (two instance), R_3 (one instance) and R_4 (3 instances)? Justify your answer. (3)



(xiv) How many child processes are created in the following fragment of code assuming essential header files are included? Explain the output with justification.

```
int main()
  {
  for (int i=0;i<4;i++)
     fork();
  return 0;
  }
```

(1+2)

(xv) Consider a system of five resources (assuming every resource is having one instance only) and four processes where every process requires two resources to complete its work. Is there any chance of deadlock in this scenario? Justify your answer after applying all the necessary conditions of deadlock. (3)

(xvi) Consider a logical address space of 512 pages with 4-KB page size, mapped onto a physical memory of 128 frames.

(a) How many bits are required in the logical address?

(b) How many bits are required in the physical address? (2+2)

SECTION B

2. (i) Consider the following set of processes, with length of the CPU burst and arrival time given in milliseconds :

Processes	Burst Time	Arrival Time
P1	9	0
P2	5	2
P3	6	3
P4	4	5
P5	8	6

(a) Draw the Gantt chart illustrating the execution of these processes using Shortest Remaining Time First (SRTF) algorithm? (3)

(b) Based on the above obtained Gantt chart, calculate the average turnaround time and average waiting time for the given processes. (3)

(ii) Illustrate with an example if the wait and signal operations are not executed atomically, then mutual exclusion is violated? (4)

3. (i) Differentiate the following :

(a) Long term schedular and Short term schedular

(b) Asymmetric multiprocessing and Symmetric multiprocessing

(c) Monolithic and Microkernel approach to Operating system design (3×2)

(ii) Consider the following page reference string :

7,0,3,1,5,2,3,4,0,7,2,1,0,4,2,0,1,7

Assuming demand paging with three frames, how many page faults would occur for the following page replacement algorithms :

(a) Optimal replacement

(b) FIFO replacement (4)

4. (i) Consider the following segment table :

Segment	Base	Length
0	219	600
1	1300	95
2	90	400
3	1327	480
4	1052	196

What are the physical addresses for the following logical addresses?

(a) 0, 230

(b) 1, 10

(c) 2, 300

(d) 3, 400

(e) 4, 200

(5)

(ii) For a paged system, Translation Lookaside Buffer (TLB) hit ratio is 80%. Let RAM access time, t is 20 ns and TLB buffer access time, T is 100 ns. Find out

(a) Effective memory access with TLB

(b) Effective memory access without TLB

(3)

(iii) Justify the requirement of logical and physical addresses in an operating system? (2)

5. (i) What is race condition in process synchronization? Explain it with an example.

(4)

(ii) Consider a disk drive of 5000 cylinders, numbered from 1 to 4999. (6)

The drive is currently serving a request at cylinder 143, and the previous request was at

cylinder 125. The queue of pending request in FIFO order is 86, 1470, 913, 1774, 948, 1509

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

(a) Shortest seek time first (SSTF)

(b) Circular SCAN (C-SCAN)

Give all the intermediate calculations.

6. (i) Compare and contrast the following : (4)

(a) Peer to Peer Computing and Client-Server Computing

(b) Data parallelism and Task parallelism

(ii) What is the role of virtualization in cloud computing? (4)

(iii) Compute the context switch time for a user process of 100 MB using the swapping memory management scheme, if the backing store has a transfer rate of 50MB per second. (2)