This question paper contains **4+2** printed pages]

Roll No. | | | | | | | | | | | |

S. No. of Question Paper : **1566**

Unique Paper Code : **2341301** **F-3**

Name of the Paper : **Operating System**

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

Semester : **III**

Duration : **3 Hours** Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Section A is compulsory. Attempt any **4** questions from Section B.

Parts of a question must be answered together.

SECTION A

1. (*a*) Name the scheduler responsible for :

(*i*) swapping out partially executed programs

(*ii*) controlling the degree of multiprogramming

(*iii*) shifting a process from ready state to running state

(*iv*) selecting a proper mix of CPU bound and I/O bound processes. 2

(*b*) List an advantage and a disadvantage of integrating the user interface into the operating system. 2

(*c*) What may happen if setting the value(s) of the following registers is not privileged ?

(*i*) CPU timer

(*ii*) base register and limit register 2

P.T.O.

(*d*) Differentiate between the following :

(*i*) system calls and system programs

(*ii*) user level thread and kernel level thread

(*iii*) paging and demand paging. 3×2

(*e*) Assume that you have a page-reference string for a process with m frames (initially all empty). The page reference string has length p; n distinct page numbers occur in it. Answer these questions for any page replacement algorithm.

(*i*) What is the lower bound on the number of page faults ?

(*ii*) What is the upper bound on the number of page faults ? 2

(*f*) What is the purpose of keeping open file table by operating system ? 2

(*g*) What is need-to-know principal ? 2

(*h*) Explain any *two* program threats. 2

(*i*) What are the *two* ways to specify the pathnames in tree structured directories ? 2

(*j*) What are the challenges faced by developers of handheld devices ? 2

(*k*) What is a dispatcher and give its various functions ? 2

(*l*) Why is round-robin algorithm also called as processor sharing ? 2

(*m*) List *four* necessary conditions for deadlock to occur in the system. 2

(*n*) How many processes are created by the program segment given below ? Justify your answer.

```
main()
{
    fork();
    fork();
}
```

2

(*o*) Define transfer rate and positioning time with respect to magnetic disk. 3

SECTION B

2. (*a*) Consider the following set of processes, with the length of CPU burst time given in milliseconds.

Process	Arrival Time	Burst Time	Priority
P_1	0	8	4
P_2	2	5	3
P_3	3	6	2
P_4	5	2	1 (Highest)

(*i*) Draw Gantt charts illustrating the execution of these processes using :

(*a*) Shortest remaining time first

(*b*) Priority based (non-preemptive)

(*c*) Round robin with time quantum = 3

(*ii*) What is the turnaround time of every process for each of the scheduling algorithms given in part (*i*) ? 3+3

(*b*) What is race condition ? Give an example to show race between two different processes ? 4

3. (*a*) Consider a paging system with the page table stored in memory.

(*i*) if a memory reference takes 200 nanoseconds, how long does a paged memory reference take ?

(*ii*) if we add TLBs and 75% of all page table references are found in the TLBs, what is the effective memory access time ? Assume that the time taken to access a TLB is 20 nanoseconds. 1+3

(*b*) Consider the following memory address references :

0030, 0012, 0315, 0104, 0185, 0445, 0467, 0215, 0732, 0749, 0752, 0612, 0204, 0239, 0226, 01738, 0184, 0426, 0781, 0381, 0261, 0286, 0278, 0257, 0189, 0289, 0146, 0178.

What will the reference string corresponding to the addresses given above (assuming page size is 100 bytes) ? Determine the number of page faults for optimal page replacement algorithm. Assume that there are three frames and all of them are initially empty. 2+4

4. (*a*) Suppose the read/write head is at track 97, moving towards track 199 (the highest numbered track on the disk) and the disk request queue contains read/write requests for the sectors on tracks 84, 155, 103, 96 and 197, respectively. What is the total number of head movements needed to satisfy the requests in the queue using :

(*i*) SCAN

(*ii*) C-LOOK 6

(*b*) How are threads different from processes ? Give an example (an environment/application) where threads are more appropriate than processes. 4

5. (*a*) Draw a resource allocation graph for the following data :

$P = \{P_1, P_2, P_3\}$

$R = \{R_1, R_2, R_3\}$

$E = \{P_1 \rightarrow R_1, R_1 \rightarrow P_3, P_2 \rightarrow R_1, R_2 \rightarrow P_2, R_3 \rightarrow P_2, P_3 \rightarrow R_3\}$

The number of instances of R_1 and R_3 is 1 and R_2 is 2.

Is there a cycle in the graph ? Is the system in a deadlock state ? If not, then give reason. 5

(*b*) Explain the *three* disadvantages of linked allocation. Which disadvantage can be overcome using FAT and how ? 5

6. Write short notes (any *two*) :

(*i*) Microkernel approach

(*ii*) Real time operating system

(*iii*) Segmentation. 5+5