(*c*) For a 32 bit logical address, calculate the number of bits in the page number and page offset fields given that the page size is 2 KB. 2

(*d*) Would it be appropriate to have a web server run as a single-threaded process ? Why or why not ? 2

7. (*a*) Write two methods that implement the `wait( )` and `signal( )` operations for a semaphore *s*. 4

(*b*) Consider the following page reference string : 4

9, 5, 3, 6, 5, 8, 2, 1, 9, 9, 0, 7.

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

- FIFO replacement
- Optimal replacement.

(*c*) Justify that the mutual exclusion condition is necessary for a deadlock to occur. 2

This question paper contains **8** printed pages]

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

S. No. of Question Paper : **49**

Unique Paper Code : **32341302** **I**

Name of the Paper : **Operating Systems**

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

Semester : **III**

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

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

Question No. **1** of **35** marks is compulsory.

Attempt any *four* questions from Q. Nos. **2** to **7**.

1. (*a*) Fill in the following blanks : 5

(*i*) The two modes of execution of an operating system are ..... and .....

(*ii*) ..... provide(s) an interface to the services provided by an operating system.

(*iii*) A necessary condition for a deadlock which states that a resource held by a process cannot be taken away forcibly .....

P.T.O.

(*iv*) ..... scheduling is approximated by predicting the next CPU burst with an exponential average of the measured lengths of previous CPU bursts.

(*v*) The mapping of a logical address to a physical address is done in hardware by the .....

(*b*) What is a file allocation table ? 2

(*c*) Differentiate between : 4

(*i*) binary semaphore and mutex

(*ii*) counting semaphore and binary semaphore ?

(*d*) What is a bootstrap program ? Where is it stored ? 2

(*e*) Given five memory partitions of sizes 750 KB, 575 KB, 225 KB, 510 KB, 300 KB (in order). How would the best-fit algorithm place processes of sizes 450 KB, 540 KB, 200 KB, and 560 KB (in order) ? 2

(*f*) What are the advantages of using loadable kernel modules ? 2

(*g*) Which of the following scheduling algorithms could result in starvation ? Justify your answer : 2

(*i*) First-come, first-served

(*ii*) Shortest job first

(*iii*) Round robin

(*iv*) Priority.

5. (*a*) Two processes P1 and P2 are simultaneously accessing the following code. Demonstrate the impact of race condition in this scenario : 3

```
x = 1
Func( )
{
    If (x ==0)
        Return;
    X--;
}
```

(*b*) What do you understand by *locality of reference* ? Explain the working set model to avoid thrashing. 3

(*c*) List the different types of directory structures giving one advantage of each. 4

6. (*a*) Explain the following in the context of demand paging : 4

(*i*) Belady's anomaly

(*ii*) copy-on-write.

(*b*) Assuming a 2 KB page size, what are the page numbers and offsets for the following address references provided as decimal numbers (assume that the page numbers begin with zero) : 2

(*i*) 7825

(*ii*) 17239.