DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
B.TECH. SEMESTER VI [INFORMATION TECHNOLOGY]
SUBJECT: (IT 607) Applied Operating System

Examination	**Second Sessional**	**Seat No.**	**:**
Date	**17/02/2016**	**Day**	**: Wednesday**
Time	**12:30 pm - 01:45 pm**	**Max. Marks**	**: 36**

INSTRUCTIONS:
1. **Figures to the right indicate maximum marks for that question.**
2. **The symbols used carry their usual meanings.**
3. **Assume suitable data, if required & mention them clearly.**
4. **Draw neat sketches wherever necessary.**

Q.1 Do as directed.

(a) How a file system can have acyclic-graph directory structure? How is it allowed in Linux system? [2]

(b) What are the disadvantages of "Linear List" directory implementation? [2]

(c) Is a multilevel page table preferred in comparison to a single level page table for translating virtual address to physical address? Justify your answer. [2]

(d) What advantage is there in having different time-quantum sizes at different levels of a multilevel queuing system? [2]

(e) Consider two processes P1 and P2 accessing the shared variables X and Y protected by two binary semaphores SX and SY respectively, both initialized to 1. P and V denote the usual semaphore operators, where P decrements the semaphore value, and V increments the semaphore value. The pseudo-code of P1 and P2 is as follows : [2]

```
P1 :                          P2:
While true do {               While true do {
  L1 : .....                  L3 : .....
  L2 : .....                  L4 : .....
  X = X + 1;                  Y = Y + 1;
  Y = Y - 1;                  X = Y - 1;
  V(SX);                      V(SY);
  V(SY);                      V(SX);
 }                            }
```

In order to avoid deadlock, which among the following are the correct operators at L1, L2, L3 and L4 respectively?
(i) P(SY), P(SX); P(SX), P(SY)
(ii) P(SX), P(SY); P(SY), P(SX)
(iii) P(SX), P(SX); P(SY), P(SY)
(iv) P(SX), P(SY); P(SX), P(SY)

(f) semaphore n=0; semaphore s=1; [2]

```
void producer()
{
    while (true)
     {
       produce();
       semWait(s);
       addToBuffer();
       semSignal(s);
       semSignal(n);
     }
}
```

```
void consumer()
{
  while(true)
  {
    semWait(s);
    semWait(n);
    removeFromBuffer();
    semSignal(s);
    consume();
   }
 }
```

Consider the above procedure for the Producer-Consumer problem which uses semaphores. Which one of the following is TRUE?

(i) The producer will be able to add an item to the buffer, but the consumer can never consume it.

(ii) The consumer will remove no more than one item from the buffer.

(iii) Deadlock occurs if the consumer succeeds in acquiring semaphore s when the buffer is empty.

(iv) The starting value for the semaphore n must be 1 and not 0 for deadlock-free operation.

Q.2 Attempt *Any TWO* of the following questions. [12]

(a) Discuss translation look-aside buffer scheme with effect of hit ratio using an example. [6]

(b) (i) Consider six memory partitions of size 200 KB, 400 KB, 600 KB, 500 KB, 300 KB, and 250 KB, where KB refers to kilobyte. These partitions need to be allotted to four processes of sizes 357 KB, 210 KB, 468 KB and 491 KB in that order. If the best fit algorithm is used, which partitions are not allotted to any process? [4]

(ii) Give two differences between logical and physical addresses. [2]

(c) (i) Consider a machine with byte-addressable memory, 64 MB physical memory and a 32-bit virtual address space. If the page size is 4KB, what is the approximate size of the page table? [4]

(ii) Describe a mechanism by which one segment could belong to the address space of two different processes. [2]

Q.3 (a) Write pseudo code of hardware solution for process synchronization which uses TestAndSet atomic instruction and satisfy all three requirements of process synchronization. Also show how this algorithm satisfies three requirements for process synchronization. [6]

(b) Draw and discuss contiguous allocation and linked allocation methods of disk block allocations. Also point out advantages and disadvantages of both. [6]

OR

Q.3 (a) Write Peterson's algorithm for solution of two-process critical section problem. Write three requirements that a solution of a critical section problem should satisfy. Also show how the Peterson's algorithm satisfies these three requirements. [6]

(b) What is free space management? Discuss methods of free space management. [6]