BITS, Pilani-Dubai

IIIrd year First Semester 2011-2012

Degree:B.E.(Hons) Branch:C.S.E

COURSE TITLE : Operaing systems

COURSE NO. : CS C 372

Date : 11-1-2012

Comprehensive exam Duration:3hrs

Total marks=80 (closed book) Weightage=40%

Part-A(answer all the questions)

Q1.a)Outline the difference between deadlock prevention and deadlock detection ?(4M)

b)Given below is the request matrix(specifies the instant request for resources), allocation matrix, available vector and resource vector. Outline whether a deadlock has happened now ? If so which processes are involved in deadlock and why they are caught in a deadlock ? (4+4)

	R1	R2	R3	R4	R5
P1	0	1	0	0	1
P2	0	0	1	0	1
P3	0	0	0	0	1
P4	1	0	1	0	1

Request Matrix Q

	R1	R2	R3	R4	R5
P1	1	0	1	1	0
P2	1	1	0	0	0
P3	0	0	0	1	0
P4	0	0	0	0	0

Allocation Matrix A

R1	R2	R3	R4	R5
2	1	1	2	1

Resource Vector

R1	R2	R3	R4	R5
0	0	0	0	1

Available Vector

Example for Deadlock Detection

Q2.a)specify any 2 important advantages of virtual memory concept ?(2M)

b) assume that the system has a process A which has 5 pages. Let the page 1 to page5 occupy frames of 10 to 15. Let the size of the page is 512 bytes. Let there be a maximum of 20 frames in main memory. With a block diagram explain how a virtual address of the process A with page number 3 and offset 25 is converted into physical address using the memory management unit ? (6M)

PTO

c)what is a page fault and how it is handled ?(4M)

Q3.a) Assume that the OS continuosly reads data via a modem which is a slow speed device.After inputting a block of data say 512 bytes then OS wants to store the same into Hard disk(while continue to receive data via modem). Outline the need for double buffering in the above scenario.(4M)

b)compare the performance of interrupt driven data transfer from an I/O to memory with that of data transfer via polling from an I/O device to memory using the CPU ?(8M)

Q4. Consider a queue of requests to read data from the specified tracks of a hard disk a given below:

98,183,37,122,14,124,65,67

Let the inner most track is 00 and the outer most track is 199.

a)Let initially the R/W head starts at 53. Using FCFS type of handling requests how many tracks will be traversed to handle the requests as given above.(4M)

b) Let initially the R/W head starts at 53. Using shortest-seek-time-first(SSTF)algorithm how many tracks will be traversed to handle the requests as given above.(4M)

c)) Let initially the R/W head starts at 53 and move towards track 0. Using scan disk scheduling algorithm how how many tracks will be traversed to handle the requests . (4M)

Q5.a) Consider a bounded buffer problem that involves a producer and consumer which operate at different speeds. Let producer is very fast compared to a consumer. Under this condition what sort of synchronization issues are involved?(4M)

b) How the above synchronization issues are solved using semaphores?(8M)

Part-B (answer all the questions)

Q1. Consider the readers/writer problem with proper synchronization as given below.(4M)

PTO

Readers/Writers

```
// number of readers
int readcount = 0;
// mutual exclusion to readcount
Semaphore mutex = 1;
// exclusive writer or reading
Semaphore w_or_r = 1;

writer {
   wait(w_or_r); // lock out readers
   Write;
   signal(w_or_r); // up for grabs
}
```

```
reader {
   wait(mutex);      // lock readcount
   readcount += 1; // one more reader
   if (readcount == 1)
      wait(w_or_r); // synch w/ writers
   signal(mutex);   // unlock readcount
   Read;
   wait(mutex);      // lock readcount
   readcount -= 1; // one less reader
   if (readcount == 0)
      signal(w_or_r); // up for grabs
   signal(mutex);   // unlock readcount}
}
```

Suppose the first wait(mutex) and first wait(w_o_r) in the reader's method are interchanged what will happen ?

Q2.what is meant by data transfer using cycle stealing method of DMA controller and when it is needed ?(4M)

Q3.Assume a bounded buffer problem involving a producer and consumer that operates at different speeds. How synchronization can be achieved using monitor and condition variables ?(4M)

Q4.Justify how spin locks can be used for synchronization of threads from multiple CPUS in critical section whereas the same cannot be done for DI types of locks.(4M)

Q5.Using bankers algorithm for resource allocation of processes,the resultant matrix at any point of time is given below .Justify whether this is a stable state or not?(4M)

	R1	R2	R3
P1	3	2	2
P2	6	1	3
P3	3	1	4
P4	4	2	2

Claim Matrix

	R1	R2	R3
P1	2	0	1
P2	5	1	1
P3	2	1	1
P4	0	0	2

Allocation Matrix

R1	R2	R3
0	1	1

Available Vector

BITS, Pilani – Dubai
International Academic City, Dubai

III Year (Computer Science)

First Semester, 2011-2012

Course No: CS C372 **Course Title: Operating Systems**

Date: 18th Dec 2011 **Weightage: 20%**

Duration: 50 mts **Max. Marks. 20**

Answer all the questions(open book)

Q1.a) with simple program using java or pseudo code specify under what circumstances does a multithreaded solution using multiple kernel threads provide better performance than a single-threaded solution on a single-processor system? [3 M]

b)Provide an example program in which multithreading does *not* provide better performance than a single-threaded solution on a single-processor system.[2M]

Q2. Consider a multiprocessor system and a multithreaded program written using the many-to-many threading model. Let the number of user-level threads in the program be greater than the number of processors in the system. Discuss the performance implications of the following scenario.(Assume that only one process is there as mentioned above)

a. The number of kernel threads allocated to the program is less than the number of processors.[2.5 M]

b. The number of kernel threads allocated to the program is equal to the number of processors[2.5M]

Q3. Consider 2 functions func1( ) run by thread1 and func2() run by threads in a non pre emptive thread scheduler of a process P. Thread1 is started before thread2. Assume a single CPU system.

```
Func1( ) {

Int a =10;

Int b=20;

Threadsleep(3000);

Int c =a+b;
```

```
Cout <<c;

Thread_yield( );

Threadsleep(5000);

D=c+10;

Cout<<d;

}



Func2( ) {

Int  x =10;

Int  y=20;

Threadsleep(2000);

Int  z=x+y;

Cout <<z;

Thread_yield( );

}
```

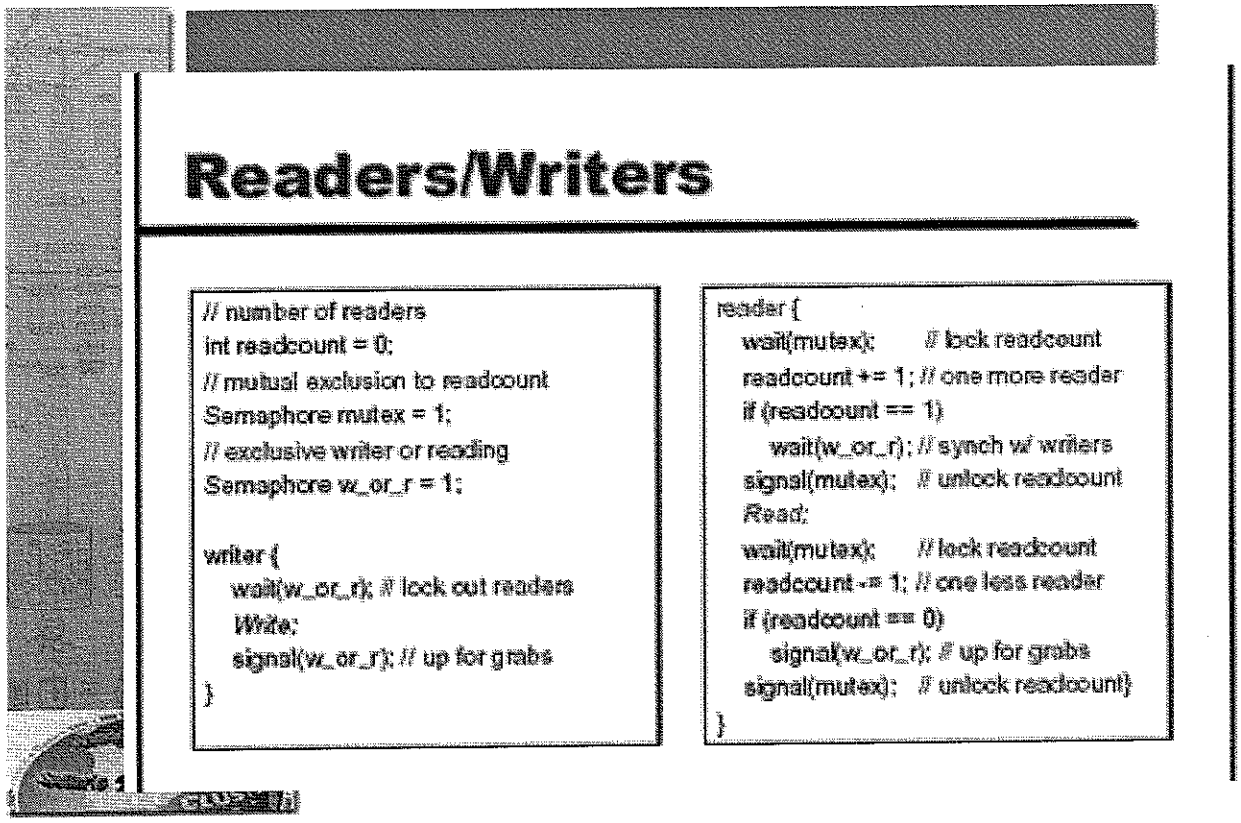
a)Consider 2 functions func1( ) run by Thread1 and func2() run by Thread2. Assume that non pre emptive thread scheduling takes place and let thread1 starts ahead of thread2. Let the system contains only one CPU and only one process P that contains the above functions. Using timing diagrams specify at what times the values c,d,z will be printed.[3M]

b) With respect to part a) if you call Thread_yield() of Func2( ) before you call Thread_exit() , what will happen to the outputs c,d,z and when they will be printed?[2M}

Q4. a)Consider a readers/writers problem. Let the system contains 3 CPUS and let a process P contains both the readers/writer code. Assume that process P is only one running in the above system. Assume that writer thread starts (from CPU1) at t=0 and starts the writer method. The time for Write within writer method is 300 msec. Let Reader Thread1 starts(from CPU2) at t= 50 m.sec and Reader Thread2 (from CPU3) starts t= 100 msec and enter into the Reader method. Let the time for Read operation in Reader method is 200 m.sec. . Let reader and writer

share a common memory for Read or Write operation. If you do not provide explicit synchronization what will happen to above scenario?[1.5M]

b)



Assume that you have provided synchronization using semaphores as given above.

With the help of timing diagram specify the values of the count variable for semaphore mutex

and semaphore w_or_r, and the readcount and the states of all threads at regular interval of 50 m.sec starting from t=0 until both write and read operations are over..Ignore the time involved in executing all instructions except the Write and Read whose timings are already given. [3.5M]

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III rd Year First Semester 2010-11

Degree:B.E.(Hons) Branch:C.S.

COURSE TITLE : : Operating Systems

COURSE NO. : CS UC372

Date : 7-11-11

Total marks=14 (Closed book) Weightage=7%

Quiz2(closedbook)

Answer all the questions .all questions carry equal marks. Answer should be brief and upto the point(7*2=14 M)

1 Specify 2 important reasons to create a thread pool for web applications

2.Justify the demerits of lock created using Disable interrupt instruction ?

3..Suppose I want to implement

Result= (x*y*z)/(a*b*c)

I want to perform concurrent operations for performing the numerator and Denominator. Specify any two approaches with their relative merits and demerits for the same assuming that multiple CPUS are there. Make any valid assumption if necessary.

4.In what way a multithreaded MS word will be superior compared to non multithreaded one ?

5. public class ThreadDemo implements Runnable

```
{
   private int x;

   public ThreadDemo()
   {
      Thread threadobj = new Thread(this);
      threadobj.start();

      try{
      Thread.sleep(2000);
       }
       catch(Exception e)
       {
```

```
        }
        System.out.println("welcome from main thread");
    }

    public void run()
    {
      System.out.println("welcome from secondary thread");
    }
}
```

Justify how will be the order of output of the above java programme . How will you reverse the order of the output of the above programme?

6.Under what circumstances a java thread will be in finite time waiting state and non finite time waiting state? when it will come out of the above states ?

7.Give an example for a function where there is race condition and another function where there is no race condition ?