9/12/19 (M)

(74)

[This question paper contains 12 printed pages]

Your Roll No. : ....

Sl. No. of Q. Paper : **7404** J

Unique Paper Code : 32341302

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

Name of the Paper : Operating Systems

Semester : III

Time : 3 Hours **Maximum Marks : 75**

Instructions for Candidates :

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

(b) Question No. **1** of **35** marks is compulsory.

(c) Attempt any **four** questions from Question No. **2** to Question No. **7**.

1. (a) Fill in the blanks : 6

    (i) .... is a necessary condition for a deadlock according to which at least one resource is held in a non-sharable mode.

P.T.O.

(ii) Loading the pages of a process into memory only when they are needed is termed as ....

(iii) Updating the caches of all processors to reflect any modification of data in one cache is termed as ....

(iv) The time needed for the required sector to rotate to the disk head during a disk access is termed as ....

(v) .... is the location within the directory structure where a file system is to be attached (in Unix system).

(vi) .... provide an interface to the services made available by an operating system.

(b) Differentiate between :   2×4=8

(i) zombie and orphan process

(ii) mutex and binary semaphore

(iii) system and application program

(iv) symmetric   and   asymmetric multiprocessing

2

(c) What will be the output of the following code ? Explain your answer. 3

```
int main()
{
    int x = 1, p;
    p = fork();
    if(p == 0)
        x = 10;
    else
    {
        wait(NULL);
        printf("%d\n",x);
    }
}
```

(d) Given the logical address 0xAEF9 (in hexadecimal) with a page size of 256 bytes, determine (i) the page number (ii) page offset.

3

(e) What is file-open count ? Where is it stored ? When does its value become zero ?

3

(f) What will be the output of the following code ?

3

```c
int main()
{
  pid_t pid;
  execlp("/bin/ls","ls", NULL);
  pid = fork();
  if(pid<0)
  {
    printf("fork failed");
    return 1;
  }
  else if(pid==0)
    execlp("/bin/ls","ls",NULL);
  else
  {
    wait(NULL);
    printf("child finished");
  }
  return 0;
}
```

```
            pthread_create(&tid,NULL,func,NULL);

            pthread_join(tid,NULL);

            printf("a = %d, b = %d \n",a,b);

        }

    void *func()

    {   int b;

        a = 50;

        b = 100;

    }
```

(c) (i) What is the purpose of inode in Unix
operating system ?   2

(ii) Given memory partitions of 100 KB, 500
KB, 200 KB, 300 KB and 600 KB (in order),
how would the best-fit algorithm place
processes of 212 KB, 417 KB, 112 KB and
426 KB (in that order) ?   2

(g) Distinguish between the following : turnaround time, waiting time, response time. **3**

(h) How many disk accesses are required to access the ith block of a file in case the file system uses : **3**

   (i) contiguous allocation scheme

   (ii) linked allocation scheme

(i) What is thrashing ? How is it related to degree of multiprogramming ? **3**

2. (a) What are traps ? Mention any **two** situations in which a user program would generate a trap. **3**

(b) What will be the output of the following code fragment ? Justify your answer.

   3

```
int a,b;
void *func();
int main()
{
    pthread_t tid;
    a=10;
    b=20;
```

P.T.O.

3. (a) A counting semaphore was initialized to 10. At a later point in time, the semaphore has value 6. At yet another point in time, it has value −3. What is the meaning of the three values ? 3

(b) List an advantage and a disadvantage. of integrating the user interface into the operating system. 3

(c) In a demand-paged memory, the page table is held in registers. It takes 8 milliseconds to service a page fault if an empty page is available or the replaced page is not modified, and 20 milliseconds if the replaced page is modified. Memory access time is 100 nanoseconds. Assume that the page to be replaced is modified 70 percent of the time. What is the maximum acceptable page-fault rate for an effective access time of no more than 200 nanoseconds ? 4

4. (a) What are the three classes of users of a file in Unix system ?   3

(b) Describe one drawback of priority based scheduling schemes. How can it be handled ?   3

(c) Consider the following lines of code from two processes P1 and P2 sharing the variable z. Explain how can the following code lead to a race condition ?   4

P1:   P2:

z += x;   z += y;

5. (a) Consider the following segment of code. Given that the goal is to print the value of variable g updated by the function func(), find and explain the flaw in the code and fix it.   3

```
int g;
void *func();
int main()
{
    pthread_t tid;
    pthread_create(&tid,NULL,func,NULL);
    printf("g = %d",g);
```

```
void *func()

{

g = 10;

}
```

(b) Mention **two** advantages and **one** disadvantage of the microkernel approach to system design. 3

(c) Consider the following set of processes with the length of CPU burst given in milliseconds : 4

Process	Burst time
P1	4
P2	2
P3	7
P4	5

The processes are assumed to have arrived in the order P1, P2, P3, P4, all at time zero.

(i) Draw a Gantt chart illustrating the execution of proceses using Round Robin scheduling algorithm. (Time quantum = 3)

P.T.O.

(ii) What is the turnaround time of each process ?

(iii) What is the waiting time of each process ?

6. (a) Briefly describe the roles of short term, medium term and long term schedulers.

3

(b) Give an example demonstrating that presence of a cycle in a resource-allocation graph does not necessarily lead to a deadlock.

3

(c) (i) Assume the value of base and limit registers are 500 and 350 respectively. Is the access to following addresses legal – 355, 500 ?

2

(ii) Assuming linked allocation and block size of 4KB, calculate the number of disk accesses required for direct access to byte 20680.

2

7. (a) Consider a disk queue holding requests to the following cylinders in the listed order : 116, 22, 3, 11, 75, 185, 100, 87. Using the C-SCAN scheduling algorithm, what is the order in which the requests are serviced ? Assume that the disk head is at cylinder 88 and moving upwards through the cylinders.

3

(b) Assuming a page size of 8KB, and a 28 bit logical address, determine : 3

(i) number of bits used to represent the page offset ?

(ii) number of entries in the page table ?

(c) (i) Determine the logical address given that the relocation register is set to 100 and a physical address 250 is generated.

2

(ii) Consider a linked allocation file system that has both logical and physical block sizes of 1-KB. If the head is currently at logical block four and the next logical block to be accessed is nine, how many physical blocks must be read from the disk ? Justify your answer.　　　　2