Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL 576104

(Constituent College of Manipal University)

FIFTH SEMESTER B. Tech(IT) DEGREE MAKE UP EXAMINATION, JANUARY 2016

SUBJECT: OPERATING SYSTEMS – ICT 301

(REVISED CREDIT SYSTEM)

TIME: 3 HOURS **06/01/2016** **MAX. MARKS: 50**

Instructions to candidates

- Answer any **FIVE FULL** questions.
- Missing data, if any, may be suitably assumed.

1A. Explain the following with a neat diagram.

(i) Process Control Block (iii) Context Switch

(ii) Multilevel Queue Scheduling (iv) Multilevel Feedback Queue

1B. Suppose that a disk drive has 500 cylinders, numbered 0 to 499. The drive is currently serving a request at cylinder 113, and the previous request was at cylinder 109. The queue of pending requests, in FIFO order, is 416, 470, 91, 174, 94, 150, 102, 195, 62, 130. Give pictorial representation of the head movement. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for SSTF and C-LOOK disk-scheduling algorithms?

1C. Explain the dual mode of operation used to protect hardware. What is its significance?

[5+3+2]

2A. Consider the following set of processes, with the length of the CPU burst given in milliseconds:

Process	Arrival Time	Burst Time
P1	1	4
P2	5	2
P3	2	12
P4	0	8
P5	4	1

(i) Draw Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, pre-emptive SJF.

(ii) What is the turnaround time of each process for these two scheduling algorithms?

(iii) What is the waiting time of each process for each of these scheduling algorithms?

(iv) Which of the algorithms results in the minimum average waiting time (over all processes)?

2B. For a process with logical address space of 3888, assuming a 1-KB page size, what are the physical addresses generated for the following logical addresses (provided as decimal numbers): 1342, 3333, 2733, 4000. Page table entries are 9, 4, 7, 2 (in order).

2C. Write a note on thread pools. [5+3+2]

3A. Assume that there are 10 direct pointers to data blocks, 1 indirect pointer, 1 double indirect pointer, and 1 triple indirect pointer. Assume that the size of the data blocks is 1024 bytes = 1Kb, i.e., BlockSize = 1Kb. Assume that the block numbers are represented as 4 byte unsigned integers, i.e., BlockNumberSize = 4b. Some data blocks are used as index blocks. They store 1024 bytes / 4 bytes/entry = 256 entries. What is the maximum number of bytes addressed by 10 direct pointers, single indirect pointer, double indirect pointer, by triple indirect pointer? What is the maximum file size?

3B. Given available memory partitions of 300KB, 5500KB, 3200KB, 9300KB, 1600KB (in order), how would each of the first fit, best fit and worst fit algorithms place processes of 1234KB, 4517KB,7812KB, 1426KB, 3133KB and 246KB (in order)? Explain.

3C. Assuming a 1-KB page size, what are the page numbers and offsets for the following address references (provided as decimal numbers):
(i) 2375 (ii) 19366 (iii) 30000 (iv) 256 [5+3+2]

4A. Explain semaphore with the operations allowed on it. Differentiate between binary and counting semaphore. Let P1 and P2 be concurrently running processes. Write the statement1 to statement4 specified in the following pseudo-code such that the output will be 'n' number of a's, 'n' number of b's, 'n' number of a's, 'n' number of b's and so on. For example, if n is 3 then the output should be aaabbbaaabbbaaa. Use semaphores for process synchronization, mention the initial values of semaphores used.

Process P1:

```
while(1){
        //statement1
        print 'a'
        //statement2
        }
```

Process P2:

```
while(1){
        //statement3
        print 'b'
        //statement4
        }
```

4B. Explain the necessary conditions for deadlock to occur and describe how circular-wait could be prevented.
4C. With the help of a neat diagram explain the different states of a process. [5+3+2]

5A. Write the Banker's algorithm for deadlock detection. There are 3 units of type X, 2 units of type Y and 2 units of type Z still available. The system is currently in a safe state. Consider the following independent requests for additional resources in the current state:
(i) REQ1: P0 requests (0 units of X, 0 units of Y and 2 units of Z)
(ii) REQ2: P1 requests (2 units of X, 0 units of Y and 0 units of Z)
Which one of the request is permitted? Explain.
5B. Write a C program (in Linux operating system) to create 3 child process for a parent. Child processes further should not create any process. All child processes should display the process identifier of the parent process and parent should not terminate until all child processes terminate. Document the program by writing comments.
5C. Explain the calculations involved in finding the demand paging performance. [5+3+2]

6A. Define RAID. Describe the two main techniques used to achieve reliability and improve performance. Explain the RAID classifications with a neat diagram.
6B. What is meant by external fragmentation? Specify the solutions to deal with external fragmentation. The following measurements are obtained from a system that uses a linear segmented memory with TLB: Number of entries in TLB=16, Time taken to conduct an associative search in TLB=160ns, Main memory access time=1μs. Determine the effective access time in ns, assuming a TLB hit ratio of 0.75.
6C. Write the content of stack, after each reference, for the stack implementation of LRU for the reference string 4,1,6,7,8,7,8,9,7,8,9,5,4,5,4,2.
[5+3+2]