Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH. (COMPUTER AND COMMUNICATION ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL 2018

SUBJECT:– OPERATING SYSTEMS [ICT 2251]

REVISED CREDIT SYSTEM

(17/04/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer ALL the questions.
- Missing data, if any, may be suitably assumed.

1A. Assume that the following jobs have to be executed with one processor, with the jobs arriving in the order listed in Table Q.1A. 5

Table Q.1A.

Process No.	Execution Time(ms)	Arrival Time(ms)
0	80	0
1	20	10
2	10	10
3	20	80
4	50	85

i. Suppose a system uses Round Robin scheduling with a time quantum of 15 ms. Draw a Gantt chart illustrating the execution of these processes.
ii. Calculate the turnaround time of each process.
iii. Calculate the waiting time of each process.

1B. What is critical section problem? Write the Peterson's solution to critical section problem. 3

1C. Illustrate with a neat diagram the multilevel queue scheduling scheme. Discuss how aging could be reduced with multilevel feedback queuing scheme. 2

2A. Consider the following snapshot of a system with five processes (P1, ...,P5) and four resources (R1, ...,R4). Currently available resources for R1,R2,R3,R4 are 2,1,0,0 respectively. 5
Current allocation matrix:P1 [0 0 1 2]; P2 [2 0 0 0]; P3 [0 0 3 4]; P4 [2 3 5 4]; P5 [0 3 3 2];
Maximum requirement matrix: P1 [0 0 1 2]; P2 [2 7 5 0]; P3 [6 6 5 6]; P4 [4 3 5 6]; P5 [0 6 5 2].

i. Compute how many resources of each type does each of the processes needs.
ii. Using Banker's algorithm, find if the system is currently safe.
iii. If a request from P3 arrives for (0, 1, 0, 0) can that request be safely granted immediately?

2B. What are monitors? Write the solution to reader writer problem using monitors. 3

2C. How do processes recover from deadlock? Explain the two most commonly used methods. 2

3A. What is demand paging? How is it different from paging? With the help of a neat diagram, explain the steps in handling a page fault. 5

3B. What is thrashing? What are the main causes of thrashing? Describe the working set model that is based on locality. 3

3C. A computer with a 32-bit address uses a two-level page table. Virtual addresses are split into a 9-bit top-level page table field, an 11-bit second-level page table field, and an offset. How large are the pages and how many pages are there in the address space? 2

4A. Suppose that a disk drive has 500 cylinders, numbered from 0 to 499. The disk head is currently serving a request at cylinder 14 and the previous request was at cylinder 12. The queue of pending requests, in FIFO order is 8, 147, 91, 177, 94, 150, 102, 9, 130. A seek takes 6 ms per cylinder moved. What is the time taken to satisfy all requests if SSTF, SCAN, LOOK and FCFS scheduling policies are used? 5

4B. In a computer system where the 'best-fit' algorithm is used for allocating jobs to memory partitions, the following situation is encountered: 3

Partition size in KB: 4K 8K 20K 2K

Job sizes in KB: 14K 2K 3K 6K 6K 10K 12K 2K 20K

Time for execution: 4 10 5 3 4 1 8 6 5

When will the 12K job complete?

4C. Suppose there is a computer system with a 48–bit logical address, page size of 16KB and 4bytes per page table entry. If we have a 48MB program such that the entire program and all necessary page tables are in memory. How much memory is used by program, including its page tables? 2

5A. Following are the snapshot of memory references (virtual addresses): 125, 3890, 236, 1420, 1345, 2100, 312, 567, 89, 2345, 6780, 3120, 82, 61234. System has three 512-byte memory frames. Pages in memory frames are replaced using LRU and optimal page replacement algorithms. Determine the number of page faults in each case. Show the contents of memory frames at each step. 5

5B. What is the priority inversion problem? How can it be overcome with the priority inheritance protocol. Explain with an example. 3

5C. A cyclic real-time scheduler is to be used to schedule three periodic tasks T1, T2, and T3 with the following characteristics: 2

Task	Phase mSec	Execution Time mSec	Relative Deadline mSec	Period mSec
T_1	0	20	100	100
T_2	0	20	80	80
T_3	0	30	150	150

Suggest a suitable frame size that can be used. Show all intermediate steps in the calculations.