Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

V SEMESTER B.TECH. (INFORMATION TECHNOLOGY)
END SEMESTER EXAMINATIONS, NOVEMBER 2018
SUBJECT: OPERATING SYSTEMS [ICT 3101]
REVISED CREDIT SYSTEM
(28 / 11 / 2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:
- Answer **ALL** the questions.
- Missing data if any, may be suitably assumed.

1A. What are the requirements that a solution to the critical section problem must satisfy? With a help of a suitable pseudocode, explain how semaphore provide a solution to reader writer problem. **5**

1B. A computer has three commonly used resources designated A, B and C. Up to three processes designated X, Y and Z run on the computer and each makes periodic use of two of the three resources.
Process X acquires A, then B, uses both and then releases both.
Process Y acquires B, then C, uses both and then releases both.
Process Z acquires C, then A, uses both and then releases both.

i. If *two* of these processes are running simultaneously on the machine, can a deadlock occur? If so, describe the deadlock scenario.

ii. Describe a scenario in which deadlock occurs if all *three* processes are running simultaneously on the machine.

iii. Modify the algorithm for acquiring resources so that deadlock cannot occur with three processes running. **3**

1C. What are the benefits and the disadvantages of each of the following?

i. Synchronous and asynchronous communication

ii. Automatic and explicit buffering

2

2A. Consider the following set of processes, with the length of the CPU-burst time given in milliseconds. Assume low priority number represents high priority.

Process	Burst Time	Priority number	Arrival Time
P1	10	3	4
P2	1	1	2
P3	2	3	5
P4	1	4	5
P5	5	2	7

Write the Gantt Chart and obtain average waiting time and average turnaround time of the processes by applying

i. Priority preemptive scheduling algorithm

ii. First come first serve algorithm

iii. Preemptive shortest job first algorithm **5**

2B. Consider a logical address space of 64 pages of 1024 words each, mapped onto physical memory of 32 frames.

i. How many bits are there in the logical address? Justify

ii. How many bits are there in the physical address? Justify **3**

2C. Consider the following programs which use a shared binary semaphore T:

Process A	**Process B**
int Y;	int Z;
A1: Y = X*2;	B1: wait(T);
A2: X = Y;	B2: Z = X+1;
signal(T);	X=Z;

T is set to 0 before any process begins to execute and X is set to 5. How many different values of X are possible after both processes finish executing? Justify your answer. **2**

3A. Suppose a new process in a system arrives at an average of six processes per minute and each such process requires an average of 8 seconds of service time. Estimate the fraction of time the CPU is busy in a system with a single processor. Discuss how the following pairs of scheduling criteria conflict in certain settings.

i) CPU utilization and response time

ii) Average turnaround time and maximum waiting time

iii) I/O device utilization and CPU utilization **5**

3B. Prove that a process requiring access to its critical section will not be delayed indefinitely. **3**

3C. Explain copy-on-write with an example. **2**

4A. Suppose that a disk drive has 4000 cylinders, numbered 0 to 3999. The drive is currently serving a request at cylinder 246, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order, is 2,069, 1,212, 2,296, 2,800, 544, 1,618, 356, 1,523, 3,965, 3,681. 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 each of the following disk scheduling

i) FCFS ii) SSTF iii) SCAN iv) C-SCAN v) LOOK **5**

4B. What are the ways in which RAID structure can be implemented? List out the advantages of RAID. **3**

4C. Explain how working set model is used to reduce thrashing with an example. **2**

5A. Consider the reference string 1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 5, 4, 2 and frame size as 4. Show the page allocation and calculate the number of page faults using FIFO, LRU and optimal page replacement techniques. **5**

5B. List any four differences between process and thread. What are the advantages of thread pool in multithreading. **3**

5C. Find the number of frames allocated to each process of size 13KB and 43 KB if there are 65 frames each of size 1KB. **2**