Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

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

MAKE UP EXAMINATIONS, JUNE 2019

SUBJECT: OPERATING SYSTEMS [ICT 2251]

REVISED CREDIT SYSTEM
(08/06/2019)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. Consider the following set of processes, with the length of the CPU burst given in milliseconds: **5**

Process	Arrival Time	Burst Time
P1	0	4
P2	2	2
P3	4	12
P4	6	8
P5	8	5

i. Draw Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, non-preemptive SJF.
ii. What is the turnaround time, waiting time of each process for each of the scheduling algorithms?
iii. Which algorithm results in the minimum average waiting time?

1B. Explain soft, hard and firm real-time systems with example. **3**

1C. With the help of a neat diagram explain the dual mode of operation of an operating system. **2**

2A. Draw and explain the disk structure. Define disk bandwidth, seek time and rotational latency. **5**

2B. Consider the following sequence of memory references for a program of page size 1KB: 5 2 4 1 2 0 5 0 6 8 2 4 3 5 1 7 2 8 2. If 3 KB of primary memory is allocated to this program, calculate the number of page faults for FIFO, LRU and Optimal page replacement methods. **3**

2C. What is context switching? Explain with a neat diagram. **2**

3A. What are semaphores? Write and explain the following. **5**
i. Two standard atomic operations on semaphore.
ii. The solution to producer consumer problem using semaphore.

3B. What is paging? Explain the paging hardware along with a neat diagram. Consider a logical address space of 8 pages of 1024 words mapped into memory of 32 frames. How many bits are there in logical address? How many bits are there in physical address? **3**

3C. Explain the significance of working set model in virtual memory management. **2**

4A. A real time system contains five jobs named J_i, for i = 1, 2, 3, 4 and 5. Their execution times are 3, 2, 1, 2, 1 respectively. All the jobs are released at time t=0ms, except J_2 which arrives at time t=4ms, also the relative deadline of all the jobs are 8ms. It has the following precedence constraints. J_1 is the immediate predecessor of J_2, and J_4 is the immediate predecessor of J_3 and J_5. There is no other precedence constraints. For all the jobs, J_i has a higher priority than J_k if $i < k$. Draw the precedence graph of the jobs. Find out the jobs which miss their deadline by providing diagrammatic representation for preemptive and non-preemptive jobs schedule with proper justification. **5**

4B. What is PCB? Explain with a neat diagram. **3**

4C. Illustrate the various multithreading models. **2**

5A. Assume that there are 5 processes, P0 through P3, and 3 types of resources A, B, C. At T_0 we have the following system state: **5**

Processes	Allocation	Max	Available
	A B C	A B C	A B C
P0	1 0 0	5 11 3	3 7 6
P1	1 3 0	3 4 4	
P2	3 3 1	4 4 4	
P3	1 2 2	6 3 4	

i. Draw the resource allocation graph for the above scenario.
ii. Use the safety algorithm to test if the system is in a safe state. Justify your answer.
iii. If the system is in a safe state, can the request from P1(1, 1, 1) be granted or not?

5B. Given five memory partitions of 100 KB, 500 KB, 200 KB, 300 KB, and 600 KB (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of 212 KB, 417 KB, 112 KB, and 426 KB (in order)? Which algorithm makes the most efficient use of memory? **3**

5C. Illustrate the difference between absolute deadline and relative deadline. **2**