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MANIPAL INSTITUTE OF TECHNOLOGY
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A Constituent Institution of Manipal University

IV SEMESTER B.TECH. (COMPUTER AND COMMUNICATION ENGINEERING)
END SEMESTER EXAMINATIONS, APRIL/MAY 2017

SUBJECT: OPERATING SYSTEMS [ICT 2251]
REVISED CREDIT SYSTEM
(19/04/2017)

Time: 3 Hours   MAX. MARKS: 50

Instructions to Candidates:

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

1A. Verify the schedulability under Rate Monotonic Algorithm and Earliest Deadline First approach. Construct the task schedule of the task set T1(2,5), T2(1,6), T3(2,10), T4(3,15).   5

1B. Consider the computer system with following scenario of memory partitions.

Partitions size in KB	4K, 8K, 20K, 2K							
Job sizes in KB	2K	14K	3K	6K	6K	10K	4K	5K
Time for execution	4	10	2	1	4	1	8	6

When will the 5k job complete if the following allocation strategy is used?   3
    i. Best fit   ii. Worst fit

1C. Discuss the models of user thread and kernel thread mappings.   2

2A. Consider the following set of processes as shown in Table Q. 2A, with the length of the CPU burst time given in milliseconds:

Table Q. 2A

Process	Arrival Time	Burst Time	Priority
P0	0	80	3
P1	10	20	2
P2	10	10	2
P3	80	20	4
P4	85	50	1

   i. Draw the Gantt chart that illustrates the execution of these processes using the following scheduling algorithms: Preemptive Shortest Job First, Round Robin (time quantum = 15ms), Non-preemptive Priority Scheduling (Lower number indicates higher priority).
   ii. Calculate the waiting time and turnaround time of all the processes.   5

2B. Consider the reference string, 0 1 3 6 2 4 5 2 5 0 3 1 2 5 4 1 0. Compare the number of page faults for the following algorithm by assuming frame size as 4.   3
    i.   LRU   ii. Optimal page replacement.

2C. Explain the advantages of the multiprocessor system over single processor system.   2

3A. Consider a system with five processes P1 through P5 and three resources types A, B, C. Resource type A has 10 instances, B has 5 instances and type C has 7 instances. Suppose at time to following snapshot of the system as given in Table Q. 3A:

Table Q. 3A

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P1	0	1	0	7	5	3			
P2	2	0	0	3	2	2			
P3	3	0	2	9	0	2	3	3	2
P4	2	1	1	2	2	2			
P5	0	0	2	4	3	3			

   i. What will be the content of the Need matrix?
   ii. Is the system in safe state? If yes, what is the safe sequence?
   iii. What will happen if process P1 requests one additional instance of resource type A and two instances of resource type C? Will the system remain in safe state? If yes what is the safe sequence?
   iv. What will happen if process P2 requests one additional instance of resource type A and one instance of resource type C? Will the system remain in safe state? If yes what is the safe sequence?   **5**

3B. Identify any three relationships between the temporal characteristics of a real workload.   **3**

3C. Describe the actions taken by a kernel to context switch between processes.   **2**

4A. A barbershop consists of a waiting room with n chairs and a barber room with one barber chair. If there are no customers to be served, the barber goes to sleep. If a customer enters the barbershop and all chairs are occupied, then the customer leaves the shop. If the barber is busy but chairs are available, then the customer sits on one of the free chairs. If the barber is asleep, the customer wakes up the barber. Write an algorithm to co-ordinate the barber and the customers using semaphores.   **5**

4B. What is the cause of thrashing? How does the system detect thrashing? Once the thrashing is detected, how does the system eliminate this problem?   **3**

4C. Justify which category of the real time system is most suitable for the following.   **2**
   i. Storm forecast   ii. Audio Visual System

5A. A disk drive has 8000 cylinders numbered from 0 to 7999. The drive is currently serving a request at cylinder 234, and the previous request was at cylinder 150. The queue of pending requests, in FIFO order is,
        86,1470,913,1774,948,1509,1022,1750,130
Starting from the current head position, what is the total distance(in cylinders) that the disk arm moves to satisfy all the pending requests if SSTF, C-SCAN and LOOK disk scheduling algorithms are used?
Also, mention the advantages and disadvantages of the SSTF, C-SCAN and LOOK disk scheduling algorithms.   **5**

5B. Discuss the Interprocess Communication Models. Illustrate with neat diagrams.   **3**

5C. Which resources are used when a thread is created? How do they differ from those used when a process is created?   **2**