Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH. (INFORMATION TECHNOLOGY / COMPUTER AND COMMUNICATION ENGINEERING)

ONLINE GRADE IMPROVEMENT / MAKEUP EXAMINATIONS, AUGUST 2021

SUBJECT: OPERATING SYSTEMS [ICT 2258]

REVISED CREDIT SYSTEM
(13/08/2021)

Time: 2 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. The Table Q. 1A. shows the arrival time and execution time in milliseconds of five processes. Draw a Gantt chart showing the scheduling of the processes using preemptive SJF scheduling algorithm. Find the average waiting time and average turnaround time of all the processes in the system. **6**

Table Q. 1A.

Processes	Arrival Time	Burst Time
P1	0	6
P2	1	8
P3	3	10
P4	5	3
P5	4	4

1B. What are threads? Describe any five threading issues in detail. **4**

2A. The Table Q 2B. shows the priority, arrival time and execution time in milliseconds for five processes. Draw a Gantt chart showing the scheduling of the processes using preemptive priority scheduling algorithm. Find the average waiting time and average turnaround time of all the processes in the system. [lower value depicts higher priority] **6**

Table Q 2B.

Processes	Arrival Time	Burst Time	Priority
P1	0	4	1
P2	2	2	2
P3	3	6	4
P4	4	10	3
P5	5	8	5

2B. What is the need of operating system's dual mode of operation? Explain with a neat diagram. **4**

3A. Write a Dekker's final correct solution to critical section problem and explain. Justify how it meets the three requirements of critical section problem. **6**

3B. Give the definition of Swap() and TestAndSet() instructions, and the code that provides mutual-exclusion by using these instructions. Describe how TestAndSet() can be used to provide mutual exclusion that satisfies bounded-waiting requirement. **4**

4A. What are monitors? Write a pseudo code to solve Dining-Philosopher problem using Monitors and Explain. **6**

4B. What is a semaphore? Write the definition of wait() and signal() that does not use busy waiting. Given three processes P1, P2, and P3 running concurrently which uses a shared integer variable A. Write the pseudo code using the counting semaphore S, to ensure that process P3 prints/displays the value of A only after either P1 or P2 assigns randomly generated integer value to A. **4**

5A. Assume that there are 5 processes, P0 through P4, and 4 types of resources. At T0 we have the following system state: **6**

Processes	Allocation	Max	Available
	A B C D	A B C D	A B C D
P0	0 1 1 0	0 2 1 0	1 5 2 0
P1	1 2 3 1	1 6 5 2	
P2	1 3 6 5	2 3 6 6	
P3	0 6 3 2	0 6 5 2	
P4	0 0 1 4	0 6 5 6	

(i) find the need matrix

(ii) Use the safety algorithm to test if the system is in a safe state

(iii) If the system is in a safe state, can the following independent requests be granted or not?

a. P1 requests (2,1,1,0)
b. P2 requests (1,0,0,0)

5B. Answer the following along with proper justification: **4**

i. Consider a system with 3 processes that share 4 instances of the same resource type. Each process can request a maximum of K instances. Resource instances can be requested and released only one at a time. Find largest value of K that will always avoid deadlock?

ii. A computer has 6 tape drives, with n processes competing for them. Each process may need two drives. What is the maximum value of n for the system to be deadlock free?

6A. Differentiate between paging and segmentation with a suitable example. Also, explain Paging hardware with TLB with neat diagram. How do you calculate effective memory-access time with 95% hit ratio? Assume it takes 20 nanoseconds to search the TLB and 110 nanoseconds to access memory. During TLB miss, the memory access for 'page table and frame number' and then access desired byte in memory requires 100 nanoseconds. **6**

6B. What are the different ways of memory allocation? Discuss the problems associated with each. Also, discuss how to overcome these problems. **4**