Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

I SEMESTER MCA
END SEMESTER EXAMINATIONS
FEBRUARY 2021
SUBJECT: OPERATING SYSTEM (MCA 4153)

REVISED CREDIT SYSTEM

(01/03/2021)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL FIVE** questions.
- Missing data may be suitably assumed.

1A.	The following processes are being scheduled using a preemptive priority and round robin scheduling algorithm. Each process is assigned a numerical priority, with a higher number indicating a higher relative priority. In addition to the processes listed below, the system also has an ***idle task*** (which consumes no CPU resources and is identified as *Pidle*). This task has priority 0 and is scheduled whenever the system has no other available processes to run. The length of a time quantum is 10 units. If a process is preempted by a higher-priority process, the pre-empted process is placed at the end of the queue.	**5**

PID	Priority	Burst Time	Arrival Time
P1	40	20	0
P2	30	25	25
P3	30	25	30
P4	35	15	60
P5	5	10	100
P6	10	10	105

i. Show the scheduling order of the processes using a Gantt chart.
ii. What is the turnaround time for each process?
iii. What is the waiting time for each process?
iv. What is the average waiting time and turnaround time?

1B.	Given the burst time of a process as 10 units of time and it follows round robin scheduling algorithm. Time quantum in different cases are 12, 6, and 1. Explain the relation of time quantum and context switch in the above-mentioned cases. Also, draw the Gantt chart for each time quantum.	**3**
1C.	What are the limitations of semaphore?	**2**

2A.	Prove that Peterson's Solution holds true for mutual exclusion, progress and bounded wait.	**5**
2B.	With neat diagram, discuss how the process is mapped into the memory during execution.	**3**
2C.	With the help of given scenario, explain Convoy effect.	**2**

PID	P1	P2
AT	0	1
BT	200	10

PID	P1	P2
AT	1	0
BT	200	10

PID: Process ID, AT: Arrival time, BT: Burst time

3A.	Explain Producer-Consumer problem with the buffer size 5. Also, explain overflow and underflow condition in Producer-Consumer problem.	**5**
3B.	With a suitable example, explain race condition in cooperating processes. Also, mention the solution for it.	**3**
3C.	Show that if the wait and signal operations are not executed atomically then mutual exclusion may be violated	**2**
4A.	Consider the following snapshot of a system:	**5**

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

Answer the following questions using the banker's algorithm:

i) Illustrate that the system is in a safe state by demonstrating an order in which the processes may complete.

ii) If a request from process $P1$ arrives for (1, 1, 0, 0), can the request be granted immediately?

4B.	Using the given reference string:- **1 2 3 4 1 2 5 1 2 3 4 5**, explain Belady's anomaly using i) 3 frames ii) 4 frames	**3**
4C.	What are the three issues that need to be addressed if preemption is required to deal with deadlocks?	**2**
5A.	With a neat diagram, explain how address translation is performed in segmentation.	**5**
5B.	Differentiate between compile time, load time, and execution time address binding with example.	**3**
5C.	Consider there are six-memory partition of size 200KB, 400KB, 600 KB, 500 KB, 300 KB and 250 KB. These partition need to be allocated to four processes of size 357 KB, 210 KB, 468 KB, 491KB in the same order. If the best fit algorithm is used which all partitions are allotted to these processes.	**2**