BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
First Semester 2023-2024

Course Title: OPERATING SYSTEMS Course No: CS F372

MID SEM (*Regular)* Date: 11-11-2023

Duration 90 Minutes Open Book MM: 70

Q1. Consider the following set of processes with length of CPU burst, arrival time and priority given below. Assuming that process P3 and P1 go for single I/O after executing for 3-time unit and they do the I/O for 2 and 3-time unit respectively. Assume, dispatcher takes 1 unit of time.

A) Draw the Gantt chart to show the schedule and find out normalized turn-around time, average wait time for each process for the following scheduling algorithm.

I. Preemptive priority
II. SRTF
III. RR with time quantum of 4 unit
IV. Virtual round robin algorithm with time quantum of 3 units.

B) Compute the percentage dispatcher overhead for each of the scheduling algorithm given above.

[4*(3+ 1+1)+4]

Process	**Burst Time**	**Priority**	**Arrival Time**
P1	10	6	4
P2	6	4	1
P3	7	5	0
P4	7	3	3
P5	5	7	2

Q2. Answer the following questions in brief. Answers without reason will not be given any credit.

Note: Answer all the Parts of the question together.

a) Does the priority scheduling algorithm favours the CPU bound processes? Support your answer with reason
b) Can RR scheduling suffer from convoy effect? Support your answer with reason.
c) List the disadvantages of keeping time quantum value very small in case of RR scheduling.
d) Give the reason why VRR cannot lead to starvation?
e) In case of deadlock recovery, its suggested to select the victim process which has highest amount of resources allocated to it. Give the advantages and disadvantages of such an approach.

[2*5]

Q3. A system is having 4 processes P1, P2 , P3 and P4 . Assume that all processes execute forever except for process P1 which executes for 160 clock ticks. These processes belong to two different groups G1 and G2 with associated weights of 0.5 each. The process P1 and P2 belongs to Group G1 and P3, P4 belong to group G2 . The base priority of process P1 , P2, P3 and P4 is 58 , 60 , 64, and 62 respectively. Assume all processes are processor bound and are ready to run. The priorities are calculated after every second and between two priority calculations 120 clock ticks are generated. Ties are resolved arbitrarily.

For this system using Fair share scheduling algorithm show the tabular representation of process execution sequence for first 5 seconds of execution. [15]

Q4. An electronic device manufacturing company plans to manufacture a device which can be used in home automation. The device manufacturing requires four processes namely MKPCB, FIXIC, TEST and FIXB.

Process MKPCB makes a PCB (Printed Circuit Board) and keeps it in outgoing tray. The tray can hold only one PCB at a time. The process FIXIC mounts two IC chips on PCB, one by one. The process TEST, tests the functionality of IC mounted PCB. The Process FIXB takes the tested IC mounted board and fixes it in a metallic box with the help of two numbers of screws. The process FIXB puts one screw at a time. Once the FIXB finishes the task, the entire set of operations can be repeated indefinitely.

The following constraints are put on individual Processes for smooth operations of the manufacturing plant.

Until PCB is made, IC chips cannot be mounted on it . Until all the required number of IC chips are mounted on PCB board, the board cannot be tested. Once the board is tested then only it can be fixed in the metallic box. Once the board is fixed in the metallic box then only the next PCB can be made.

Write the pseudo code for each processes using only counting semaphores to achieve the required synchronization. Do not use any shared variables for synchronization. [15]

Q5. Consider the following snapshot of a system having 6 processes (P1 to P6) and 5 Resources (R1 to R5)

Allocation

	R1	R2	R3	R4	R5
P1	4	2	2	3	0
P2	1	2	1	2	2
P3	0	3	2	1	1
P4	1	2	3	2	1
P5	1	1	2	3	2
P6	0	0	0	0	2

Request

	R1	R2	R3	R4	R5
P1	4	1	0	1	2
P2	1	2	0	1	2
P3	3	1	2	4	3
P4	3	0	4	3	4
P5	0	0	0	0	0
P6	5	2	4	0	4

The total number of instances of each resource type is given below.

R1	R2	R3	R4	R5
7	10	10	11	8

a) Determine if the system is in deadlock. Show all the steps to support your answer.

b) In a system there are five processes and one resource type. Each process requires 2 instances of resource type. Find the minimum number of resource instances system should have to avoid deadlock

[5+2]