Birla Institute of Technology & Science, Pilani
CS F 372 Operating Systems
First Semester 2019-2020
Mid semester Exam (closed book)

Duration : 90 minutes 03/09/2019 MM:70

Q1. Five batch jobs A through E arrive for execution at the times indicated:

Process	Arrival time	Total CPU Burst time
A	0	12
B	1	5
C	2	3
D	3	7
E	4	10

The characteristics of each process is listed below:

Process A: Executes on CPU for 6 time units and follows it by I/O for another 2 Time units and ends with a CPU burst of 6 units of time.

All other processes are totally CPU bound.

For each of the following scheduling algorithm, determine the average waiting and average normalized turnaround times. Also draw the corresponding Gantt charts. Ignore context switch overhead.

a) RR (Time Quantum = 4 units)
b) VRR (Time Quantum = 4 units)
c) SPN
d) SRTF

Assume that for SPN and SRTF the processor knows only the total CPU burst in the beginning.

[16]

Q2. The table given below describes a system consisting of 4 processes, which are grouped into two groups. The group weightage and the processes base priorities are also given. Assume all processes are processor bound and are ready to run. Processor utilization is measured as follows: The processor is interrupted 60 times per second. During each interrupt the processor usage field of the currently running process is incremented as is the corresponding group processor usage field. Once per second the priorities are recalculated. For this system using Fair share scheduling algorithm draw the Gantt chart for the first 5 seconds. Support your answer by showing all relevant calculations.

Group name	Group 1		Group2	
Process Id	P1	P2	P3	P4
Group weightage	0.6		0.4	
Process base priority	50	52	60	62

[15]

Q3. Four Processes A ,B, C and D are trying to access Critical Section. The critical section is to be accessed in mutually exclusive manner. The process A starts and executes once. process B executes twice but it cannot start execution until Process A has executed once . The process C executes only once, only when the process B has executed twice . Once the Process C has executed , process D executes twice. These processes run forever. The execution sequence is as follows.

A B B C D D A B B C D D .....

Write Pseudo code for the above process synchronization using counting semaphores only(Do not use any shared variable) . Clearly Indicate the Initialization values of all the semaphores.

(15)

Q4. Given the following snapshot of the system consisting of 5 process P0 through P4 and 5 resource types A B C, D and E :

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

a) Use the bankers algorithm to determine if the system is in safe state. Give the safe sequence if any.

b) Assuming the initial state of the system as depicted in the table, if P2 makes a request of (1, 1, 0, 0, 0), Can the request be granted? If yes, give safe sequence else show that no safe sequence exists .

(7+7)

Q5. Consider N processes share M resource units, that can be reserved and released only one at a time. The maximum claim of each process does not exceed M and sum of all maximum claim is less than M+N. Can dead lock occur in the system ? justify your answer .

[10]