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SIXTH SEMESTER   **B.TECH [SE]**

MID SEMESTER EXAMINATION (MARCH 2019)
SE-304 Operating System

Time: 1.5 hours   Max. Marks: 30

Attempt all questions.
Assume suitable missing data, if any.

1. Explain producer consumer problem and write solution for 2 process critical section problem. (6)

2. What are the necessary conditions for process synchronization? A shared variable x, initialized to zero, is operated on by four concurrent processes W, X, Y, Z as follows. Each of the processes W and X reads x from memory, increments by one, stores it to memory, and then terminates. Each of the processes Y and Z reads x from memory, decrements by two, stores it to memory, and then terminates. Each process before reading x invokes the P operation (i.e., wait) on a counting semaphore S and invokes the V operation (i.e., signal) on the semaphore S after storing x to memory. Semaphore S is initialized to two. What is the maximum possible value of x after all processes complete execution? (4)

3. a. A system has five processes P1 through P5 and four resource types R1 through R4. There are 2 units of each resource type. Given that:
   vi.   P1 holds 1 unit of R1 and requests 1 unit of R4.
   vii. P2 holds 1 unit of R3 and requests 1 unit of R2.
   viii. P3 holds one unit of R2 and requests 1 unit of R3.
   ix.   P4 requests 1 unit of R4.
   x.   P5 holds one unit of R3 and 1 unit of R2, and requests 1 unit of R3.
   Show the resource graph for this state of the system. If the system is in deadlock, draw the final resource graph and the processes involved? (4)

   b. Consider the following System:

Process	Max A, B, C, D	Allocation A, B, C, D	Available A, B, C, D
P0	6 0 1 2	4 0 0 1	3 2 1 1
P1	2 7 5 0	1 1 0 0	
P2	2 3 5 6	1 2 5 4	
P3	1 6 5 3	0 6 3 3	
P4	1 6 5 6	0 2 1 2	

   Find if the system is in safe state? If it is, find the safe sequence (4)

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4. a. Consider the 3 processes, P1, P2 and P3 shown in the table

Process	Arrival time	Burst Time
P1	0	3
P2	1	6
P3	4	4
P4	6	2

Which scheduling algorithm out of FCFS, non-preemptive SJF and Round Robin with quantum value as 2, gives the lowest average turnaround time.

b. Consider three processes, all arriving at time zero, with total execution time of 10, 20 and 30 units, respectively. Each process spends the first 20% of execution time doing I/O, the next 70% of time doing computation, and the last 10% of time doing I/O again. The operating system uses a shortest remaining compute time first scheduling algorithm and schedules a new process either when the running process gets blocked on I/O or when the running process finishes its compute burst. Assume that all I/O operations can be overlapped as much as possible. For what percentage of time does the CPU remain idle? (6)

5. Write short note on (any two): (3X2 =6)
   a. User thread vs Kernel thread
   b. Process State diagram with pre-emption
   c. O.S. Dual mode
   d. Deadlock Prevention and Avoidance