BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE
I SEMESTER 2023-24 BITS G553 REAL TIME SYSTEMS

Mid Semester Test (Regular) **11-10-2023** **Max. Marks 50**
Suggested time :30 min **Closed Book** **Closed Book part Max Marks-20**

Note: notations have their usual meaning unless stated
Answer all the parts of the question together. Parts not answered together will not be considered.
Concisely answer the question (to the point).

Q1. When do we consider a busy interval to perform Time Demand Analysis (TDA)? Why? [2M]

Q2.Can we use a general schedulability test using TDA to test the schedulability of tasks scheduled using the EDF algorithm? Why/ why not? [2M]

Q3. What is an optimal algorithm for scheduling tasks using an online priority-driven scheduling algorithm? [2M]

Q4. Why do we use non-strict LST rather than strict LST first scheduling tasks? What are the issues when strict LST is used? [1 M]

Q5. Can we say tick scheduling is the same as clock-driven scheduling as they make scheduling decisions at periodic intervals of time? Why/ why not? [2 M]

Q6. What information does the usefulness function versus tardiness graph give? Please explain using a rough sketch of the graph. [3M]

Q7. Give one example of scheduling algorithms for each of the following: [3M]

a) task level fixed and job level fixed priority algorithm
b) task level dynamic and job level fixed priority algorithm
c) job level dynamic priority algorithm

Q8. What is the purpose of a Network Flow Graph (NFG)? Which frame constraint is not considered while deciding the possible frame sizes considered for an NFG? Why? [3M]

Q9. What are the different types of release times a job can have? In which situation each of the of release time is used? [2M]

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Q1. A system of four tasks T_i (P_i, e_i) = {(8,2), (16,1.5), (24, 2) (48,4) } is scheduled with a clock-driven Cyclic scheduling algorithm. A stream of aperiodic jobs arrives as follows: Ai (r_i,e_i) = {(8,1.5);(12,2.5); (20,2)}

a) Draw a neat timing diagram choosing the proper frame size and find the average response time of the aperiodic jobs.
b) Now use the slack stealing algorithm and determine how much the percentage reduction in average response time is compared to the cyclic scheduling.
c) Consider three sporadic jobs S_i (r_i,e_i,d_i)=S_1(4,1,20), S2 (8,2,16) S3 (19,2,25). Specify whether these sporadic jobs will be accepted or not. Justify your answer with proper reasoning and methodology.

[12M]

Q2. Consider the following three fixed-priority tasks: T1(P_1,e_1,D_1)= (8, 1,6), T2 (P_2,e_2)=(9,2), T3(P_3,e_3, D_3)= (10, 4, 9) schedule using DMA
(a) Use the analytical method of Time Demand Analysis (TDA) to check whether the task set is schedulable or not...
(b) Now, if T3 has a non-preemptive portion of 1 time unit, T1 self suspends 4 times with a total self-suspension time of 3 time units and the context switching time is 0.1-time units for every context switch, determine whether the given task set is schedulable. Use the iterative method of TDA to conclude.

[12 M]

Q3. Consider the periodic Tasks T1 = (10, 2); T2 = (15, 2) and T3 = (30, 3). Show the schedule of these tasks till time t=25 using non-strict LST algorithm by showing all the required calculations.

[6 M]