Reg. No. | | | | | | | | | | |

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

SEVENTH SEMESTER B.TECH. (INSTRUMENTATION AND CONTROL ENGG.)

END SEMESTER DEGREE EXAMINATIONS, DECEMBER - 2020

SUBJECT: REAL TIME EMBEDDED SYSTEMS [ICE 4003]

30-12-2020

TIME: 3 HOURS MAX. MARKS: 50

Instructions to candidates :*Answer ALL questions and missing data may be suitably assumed.*

1A. Explain the basic model of real time systems with block diagram.

1B. Classify different timing constraints of real time systems.

1C. Explain "Earliest Deadline First Scheduling" algorithm and its implementation. Also mention the shortcomings of the algorithm.

(3+3+4)

2A. Consider 6 processes P_1, P_2, P_3, P_4, P_5 and P_6 arriving in ready queue at time 0, 1, 2, 3, 4 and 5 respectively. Assume the burst time requirements are 7, 5, 3, 1, 2 and 1 respectively. Use Shortest Remaining Time First scheduling method to find the average waiting time and average turn around time.

2B. Consider the following set of 3 periodic real time tasks: T_1=(e_1=10, p_1=20), T_2 =(e_2=15, p_2=60), T_3 = (e_3=20, p_3=120) to be run on a uniprocessor. Determine whether the task set is schedulable under Rate Monotonic Algorithm.

2C. Define Jitter and Task utilization.

(5+3+2)

3A. Compute different types of inversions that each task might have to undergo for the task graph shown in Fig. Q 3A. Assume tasks have been sorted in order of priority. Task T_1 has highest priority and task T_6 has least priority.

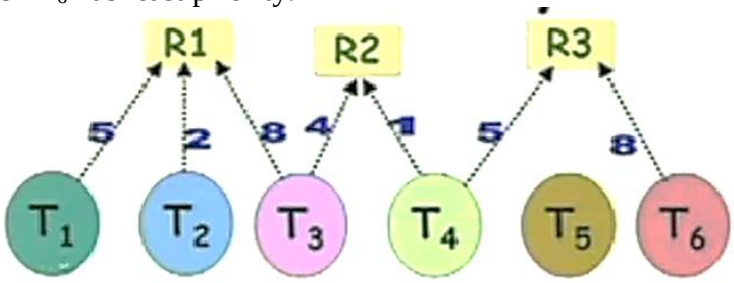

Fig Q 3A

3B. Explain Priority Ceiling Protocol and rules for handling resource requests with suitable examples.

3C. Suppose a distributed system has 12 clocks. The clocks are required to be synchronized within 1 ms of each other. Assume at best 2 clocks in the system are Byzantine. Maximum drift rate of the clocks is 6 x 10^{-6}. Determine the rate at which the clocks need to exchange time values.

(4+3+3)

4A. Compare token bus and ring based architectures with relevant figures.

4B. Describe hardware redundancy and the techniques used to achieve hardware redundancy.

4C. Explain utilization balancing algorithm for task allocation in multiprocessor system.

(4+4+2)

5A. Explain how real time application development is done on a host machine using host target approach.

5B. Write a short note on VxWorks and QNX operating system.

5C. List the features of Real Time Operating System.

(4+4+2)

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