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, NOVEMBER - 2018

SUBJECT: REAL TIME EMBEDDED SYSTEMS [ICE 4003]

Time: 3 Hours **MAX. MARKS: 50**

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. What are the characteristics of real time systems? **3**

1B. Classify the timing constraints of real time systems. **3**

1C. Consider 7 processes P_1, P_2, P_3, P_4, P_5, P_6 and P_7 arriving in ready queue at time 0, 1, 2, 3, 4, 5 and 6 respectively with priority 2, 4, 6, 10, 8, 12 and 9 respectively. If the burst time requirements are 4, 2, 3, 5, 1, 4 and 6 respectively, use preemptive priority scheduling method to find the average waiting time, average turn around time and response time. Assume higher values indicate higher priorities. **4**

2A. Explain cyclic scheduler with relevant figures. List the constraints for selecting the frame size. **5**

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

2C. Compute the different types of inversions that each task might have to undergo for the task graph shown in Fig.2C. Task T_1 has highest priority and task T_6 has least priority. **3**

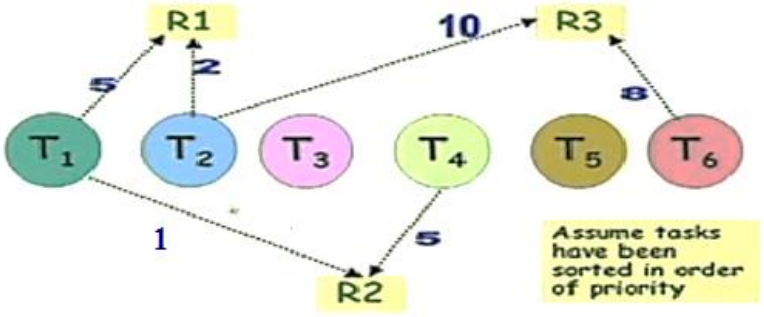

Fig.2C

3A. Explain Priority Inheritance Protocol with suitable examples. Mention the drawbacks for the same. **4**

3B.	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 6×10^{-6}. Determine (a) the rate at which the clocks need to exchange time values (b) the total number of message exchanges required per hour for synchronization.	**4**
3C.	Define fault latency and error latency.	**2**
4A.	Compare bus based architecture and ring architecture for real time communication in LAN.	**4**
4B.	Suppose a network designed using IEEE 802.4 protocol has three nodes. Node N_1 needs to transmit 1MB of data every 300ms. Node N_2 needs to transmit 1.2MB of data every 500ms. Node N_3 needs to transmit 1.2MB of data every 500ms. Select a suitable Target Token Rotation Time (TTRT) for the network and compute the token holding time for each node.	**4**
4C.	List the advantages of assembly language based development.	**2**
5A.	Explain data flow graph model and control data flow graph model with examples.	**4**
5B.	Write a short note on PSOS and VRTX operating systems.	**4**
5C.	Define Task switching time and Interrupt latency time.	**2**

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