Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
Manipal University

SIXTH SEMESTER B.Tech. (E & C) DEGREE END SEMESTER EXAMINATION
APRIL/MAY 2017
SUBJECT: REAL TIME SYSTEMS (ECE - 4004)

TIME: 3 HOURS **MAX. MARKS: 50**

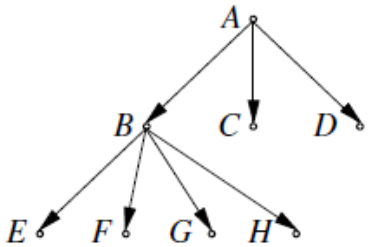
Instructions to candidates
- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A.	Briefly explain the following concepts related to scheduling and schedulabilty analysis : i) Feasible schedule ii) Priority inversion iii) Hyper period iv) Precedence graph v) Sufficient and necessary schedulability test
1B.	Describe in brief the applications of real time systems according to their timing attributes.
1C.	Real-time systems interact with the environment via the sensors and the actuators. Give an example of real-time systems that uses both sensors and actuators, i.e., your answer should include an example of a real-time system plus sensors and actuators used by that system
	(5+3+2)
2A.	With the state diagram explain semaphore and mutex. Explain the mutex with recursive locking and its use.
2B.	Explain the important differences between hard, soft and firm real time systems.
2C.	Draw the typical finite state mechanism for task execution states. Explain the each state.
	(5+3+2)
3A.	Write the selection criteria for the good scheduling algorithm. Three processes with process ID's P1, P2, P3 with estimated time 7,9,3 milliseconds respectively enters the ready queue together. Process P4 with estimated execution completion time 4ms enters the ready queue after 1ms. Process P5 with estimated execution time 10ms and highest priority enters the ready queue after 6ms. Calculate the waiting time and TAT for each processes. Also calculate average waiting time and average TAT in the non-pre-emptive SJF scheduling.
3B.	Write the typical uses of message queues with relevant diagrams.
3C.	Explain the spurious interrupts.
4A.	What is the scheduling point of a task in scheduling algorithm? How the scheduling points are determined in i) clock driven ii) event driven schedulers. Using a cyclic real-time scheduler, suggest a suitable frame size that can be used to schedule three periodic tasks T1, T2, and T3 with the following characteristics:

	Task	Phase(ms)	Execution Time (ms)	Relative deadline (ms)	Period (ms)
	T1	0	20	100	100
	T2	0	20	80	80
	T3	0	30	150	150

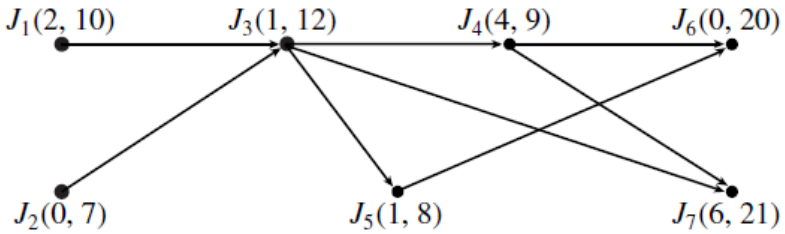
4B. Discuss the advantages and disadvantages of RM algorithm.

4C. The execution times of the jobs in the precedence graph in Figure 4.C are all equal to 1, and their release times are identical. Give a non preemptive optimal schedule that minimizes the completion time of all jobs on three processors. Describe briefly the algorithm you used to find the schedule.



5A. The feasible interval of each job in the precedence graph in figure Q 5A is given next to its name. The execution time of all jobs are equal to 1.

a) Find the effective release time and effective deadlines of all jobs
b) Find an EDF schedule of the jobs in a 3 processor system.



5B. Consider a system that has five periodic tasks, A, B, C, D and E, and three processors P1, P2, P3. The periods of A, B, and C are 2 and their execution times are equal to 1. The periods of D, and E are 8 their execution times are 6. The phase of every task is 0, that is, the first job of the task is released at time 0. The relative deadline of every task is equal to its period. Show that if the tasks are scheduled dynamically on three processors according to LST algorithm, some jobs in the system cannot meet their deadlines.

5C. Draw the typical real time communication model.

(5+3+2)