Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

SIXTH SEMESTER B.Tech. (E & C) DEGREE END SEMESTER EXAMINATION
APRIL 2018
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. What is a real time system? Give examples for real time system. Explain the characteristics of a real time system in detail.

1B. Define the following: i) tardiness ii) laxity type iii) feasible schedule iv) hyper period v) sporadic task vi) relative deadline

1C. Explain the important differences between hard, soft and firm real time systems. Give example for each.

(5+3+2)

2A. Consider a system that has five periodic tasks, A, B, C, D and E with execution times equal to 1,1,1,2 and 2 respectively. The periods of A is 2, B and D are 4, C and E are 8. All the tasks are released at time 0. The precedence constraints are A<B<C, A<D, B<E and D<E.

i) Draw the task graph
ii) Show that the tasks are scheduled dynamically on a 2 processor system P1 and P2
iii) Can these tasks be scheduled using RMA in a uniprocessor system?
iv) Suppose the tasks are to be scheduled using a table driven scheduler, compute the length of time for which the schedules have to be stored in the pre computed schedule table of the scheduler.

2B. The feasible interval of each job in the precedence graph in Fig.2.B is given next to its name. The execution time of all jobs is equal to 1.

a) Find the effective release times and deadlines of the jobs.
b) Suppose that the release times of J1 and J2 are jittery. The release time of J1 can be as early as 0 and as late as 3, and release time of J2 can be as late as 1. Explain how this variation can be considered in order to determine if all jobs can meet their deadlines?

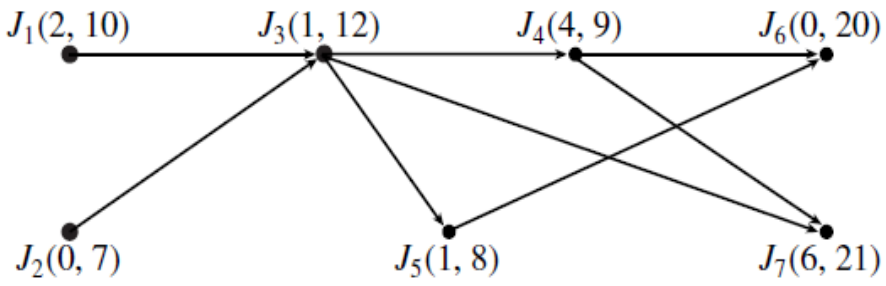

Fig 2. B

2C. Draw the state diagram of mutual exclusion (mutex) semaphore and explain the concept of recursive locking and its use.

(5+3+2)

3A. Explain the bounded and unbounded priority inversion with example diagrams. Discuss the Priority Inheritance protocol.

3B. Determine whether the following set of periodic real time tasks is schedulable on a uniprocessor using RMA

Task	Start Time (ms)	Processing Time(ms)	Period (ms)	Deadline (ms)
T1	20	25	150	100
T2	40	7	40	40
T3	60	10	60	50
T4	25	10	30	20

3C. Discuss the weighted round robin scheduling approach, how it is different with round robin scheduling and where it can be used.

(5+3+2)

4A. Assume the following set of periodic task that are to be scheduled by EDF scheduling:

Task	Period=deadline	CPU burst
A	2	1
B	3	1
C	5	1

a) Determine if the task set above is schedulable using EDF by applying suitable schedulability analysis test.

b) If the set is schedulable, draw an execution trace up to the LCM of the tasks periods. Otherwise, if the set is not schedulable draw a trace until the first deadline miss. In the case that two task instances have the same deadline, the task with earliest release time should get priority.

4B. Draw a network flow graph that can be used to find a pre-emptive cyclic schedule of the periodic tasks T1=(3,1,7), T2=(4,1) and T3=(6,2.4,8).

4C. What is slack stealing and slack time?

(5+3+2)

5A. Give the advantages and disadvantages of RMA scheduling. Show whether the tasks give feasible schedule using RM algorithm and DM algorithm. Given T1=(50,50,25,100), T2=(0,62.5.10,20), and T3=(0,125,25,50).

5B. For a given system T= {(4,1), (5,2,7),(20,5)} , find a suitable frame size . If the jobs have to made in to slices to meet the frame size constraint, show the pre-emptive schedule by placing slices in the frames.

5C. Briefly explain the ways of sending and receiving messages by tasks.

(5+3+2)