Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.TECH (CSE)/SEM-1/PGCSE-102/2012-13

2012

DISTRIBUTED REAL TIME OPERATING SYSTEMS

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Short Answer Type Questions)

1. Answer any *five* questions of the following : 5 × 2 = 10

   a) Draw the graph of Usefulness *vs.* Tardiness of job.

   b) What do you mean by "lateness" of a job ? How does it differ from "tardiness" ?

   c) Define Hyperperiod of a set of periodic task with example.

   d) What is "sporadic job" ? Site an example.

   e) What is the difference between absolute deadline and relative deadline ? Discuss with example.

   f) List two examples of deadlock that are not related to a computer system environment.

   g) Is it possible to have a deadlock involving only one single process ? Explain.

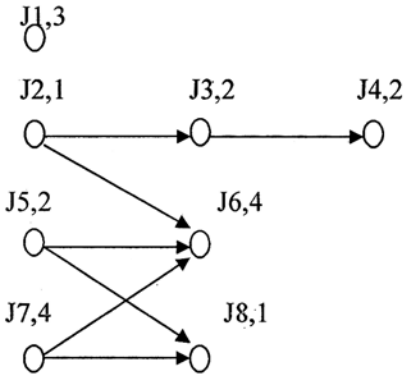
GROUP – B

(Long Answer Type Questions)

Answer any *four* questions : 4 × 15 = 60

2. a) What do you mean by criticality of jobs ? Explain with example.

   b) Consider the following task graph. If Priority-driven scheduling is used, then which one among preemtive or non-preemptive approaches is better ?



J5 is released at time 4, all the others are released at time 0.

5 + (5 + 5)

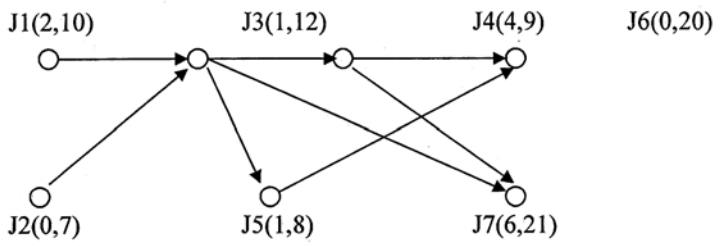
3. a) Show the anomalous behaviour of Priority-driven scheduling algorithm using the following matrix. Consider at least four cases.

Jobs	Release time	Deadline	Execution time
J1	0	10	5
J2	0	10	[2,6]
J3	4	15	8
J4	0	20	10

b) State the differences between static and dynamic systems. (4 × 3) + 3

4. a) State and prove frame size constraints in cyclic schedule.

b) Calculate the effective release time and effective deadline for each job for the following task graph.



(2 + 2 + 5) + 6

5. a) Write the Peterson Algorithm for two-process synchronization.

b) Prove that using Peterson algorithm

i) mutual exclusion is preserved

ii) the progress requirement is satisfied

iii) the bounded waiting requirement is met.

c) State the advantages of spin lock or busy waiting.

4 + (3 × 3) + 2

6. A system contains nine nonpreemptable jobs named J_i for i = 1,2,...,9. Their execution times are 3,2,2,2,4,4,4,4 and 9 respectively, their release times are 0 and their deadlines are 12. J_1 is the immediate predecessor of J_9 and J_4 is the immediate predecessor of J_5,J_6,J_7 and J_8. For all jobs J_i has a higher priority than J_k if $i < k$.

a) Can the jobs meet their deadlines if scheduled in three processors ? Explain.

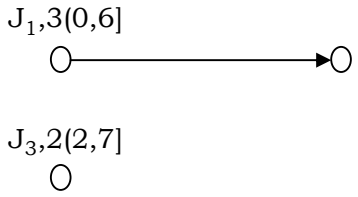
b) Can the jobs meet their deadlines if scheduled in four processor nonpreemtively ? Explain.

c) Suppose that due to an improvement of the three processors, the execution time of every job is reduced by 1. Can they meet deadlines ? Explain.

5 + 5 + 5

7. a) What do you mean by Rate-Monotonic and Deadline-Monotonic Algorithms ? Explain both with suitable examples.

b) Which algorithm is known as reverse EDF (Earliest-Deadline-First) algorithm ? How does it schedule the following jobs ?



5 + 5 + 5

8. a) Prove that when pre-emption is allowed and jobs do not contend for resources, the EDF algorithm can produce a feasible schedule of a set J of jobs with arbitrary release times and deadlines on a processor if and only if J has feasible schedule.

b) When jobs are partitioned into slices ? Consider the set of tasks

T = {(4, 1), (5, 2, 7), (20, 5)} and explain your answer.

7 + 8