Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-I Regular Examination January / February 2011

Subject code: 710105 N

Subject Name: Real Time Computing

Date: 03 /02 /2011 **Time: 02.30 pm – 05.00 pm**

Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Define following terms. **07**

(i) Release time (ii) Phase (iii) Response time
(iv) Relative deadline (v) Period (vi) Execution time
(vii) Sporadic task

(b) Discuss any one real time application of your choice in detail. **07**

Q.2 **(a)** What do you mean by scheduling of real time tasks? Explain how following terms are differing from each other with suitable example. **07**

(i) valid schedule (ii) feasible schedule (iii) optimal schedule

(b) A system contains nine non preemptable jobs named J_i for i=1, 2, …., 9. Their execution times are 3, 2, 2, 2, 4, 4, 4, 4, & 9 respectively, their release times are equal to 0 & their deadlines are 12. J_1 is immediate predecessor of J_9. J_4 is immediate predecessor of J_5, J_6, J_7 & J_8. There are no other precedence constraints. For all jobs, J_i has higher priority than J_k if i<k. **07**

(i) Draw precedence graph of the jobs.
(ii) Can jobs meet their deadlines if they are scheduled on three processors? Explain your answer.

OR

(b) Three periodic tasks are given: T1(4, 1) T2(5, 2) T3(20,5). Draw network flow graph of suitable frame size. **07**

Q.3 **(a)** A system consists of two periodic tasks. **07**

T1(2, 0.9) T2(5, 2.3)

(i) What is total utilization of system?
(ii) Construct RM schedule in interval [0, 10]. Label any missed deadlines.

(b) A system consists of three periodic tasks. **07**

T1(3, 1) T2(5, 2) T3(8, 3)

(i) What is total utilization of system?
(ii) Construct EDF schedule in interval [0, 16]. Label any missed deadlines.

OR

Q.3 **(a)** A system consists of three periodic tasks. **07**

T1(2, 1) T2(4, 1) T3(8, 2)

(i) What is total utilization of system?
(ii) Construct DM schedule in interval [0, 16]. Label any missed deadlines.

(b) Discuss about non-optimality of EDF algorithm with suitable example. **07**

Q.4 **(a)** A system consists of four jobs & two resources. Following parameters are given about them. **07**

Job	Release time	Execution time	Priority	Resource requirements
J1	0	7	4	R1 from time 1
J2	2	6	3	R2 from time 3 R1 from time 9
J3	5	3	2	R1 from time 6
J4	7	3	1	R2 from time 8

Schedule them & use priority inheritance protocol to fulfill resource requirements of all jobs.

(b) Explain various states of real time thread & draw state transition diagram for the same. **07**

OR

Q.4 **(a)** Use priority ceiling protocol to fulfill resource requirements of all jobs & schedule them whose parameters are listed in Q:4 (a) above. **07**

(b) Discuss any seven selection criteria for real time kernels. **07**

Q.5 **(a)** Discuss following optimization techniques & their impact on real time performance. **07**

(i) Common sub expression elimination
(ii) Constant folding
(iii) Loop induction elimination
(iv) Removal of dead code
(v) Constant propagation
(vi) Loop un-rolling
(vii) Cross-jump elimination

(b) Compare Amdahl's law with Gustafson's law in detail. **07**

OR

Q.5 **(a)** Explain unit level testing in detail. **07**

(b) Explain any four code smells & their refactoring. **07**

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