Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 710105N **Date: 16-01-2013**

Subject Name: Real Time Computing

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 with respect to RTS. **07**
(i) Optimal scheduler (ii) Soft real time system (iii) Sporadic task
(iv) Utilization time (v) Blocking time (vi) Absolute deadline
(vii) Slack time

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

$T_1(3, 1)$ $T_2(5, 2)$ $T_3(8, 3)$

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

Q.2 **(a)** How to find priority ceiling of a given resource? **07**
How to find priority ceiling of system?
Write scheduling rule, priority inheritance rule and allocation rule of basic priority inheritance protocol.

(b) (i) Differentiate between *valid schedule, feasible schedule* and *optimal schedule.* **03**

(ii) What is online and offline scheduling? State whether following categories of algorithms are online or offline. **04**

(x) Clock driven (y) Priority driven

OR

(b) (i) Justify the statement. **04**
No priority driven algorithm is optimal to schedule preemptable jobs on multiple processors.

(ii) Write three conditions to choose the frame size for clock driven scheduling. **03**

Q.3 **(a)** A system uses EDF to schedule sporadic jobs. The cyclic schedule of periodic tasks in the system uses a frame size of 5 and first hyperperiod contains 6 frames. Suppose that initial amounts of slack time in the frames are 1, 0.5, 0.5, 0.5, 1 and 1 respectively. **07**
Suppose that an aperiodic job with execution time 3 arrives at time 1. Find the response time if
(i) slack stealing is not used
(ii) slack stealing is used

(b) Prove that EDF is job level fixed priority algorithm and LST is job level dynamic priority algorithm with suitable example. **07**

OR

Q.3 **(a)** Draw a network flow graph that can be used to find a preemptive cyclic schedule of given three periodic tasks. **07**

$T_1=(3,1)$ $T_2(4,1)$ $T_3(6,2)$

(b) A system contains three periodic tasks. **07**

T1 (5,5,3,10) T2(0,6,1,2) T3(0,12,2,5)

(i) Make schedule using RM in interval [0, 25] and also indicate missing deadlines (if any).

(ii) Find total utilization of system.

Q.4 **(a)** A fixed priority system contains three jobs. There are three kinds of resources X, Y and Z of one unit each. The resources requirements of jobs are given below. **07**

Job	r_i	e_i	*Resource*	*Demand time of resource*	*Total usage of resource*
J_1	3.5	4	X	4.5	1.5
J_2	1	4	Y	2.5	2
			Z	10.2	0.7
J_3	0	5.5	Z	0.5	2
			Y	3	2

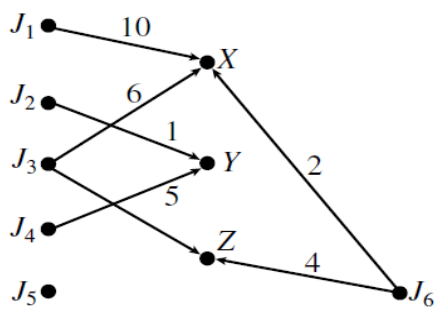
Priorities are in decreasing order from J_1 to J_3. Schedule them according to given priority such that all can complete their execution with basic priority ceiling resource access control protocol.

(b) How basic priority ceiling protocol is adapted for system having multiple unit resources? Write scheduling rule, priority inheritance rule and allocation rule of priority ceiling protocol for the same. **07**

OR

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

(b) **07**



Resource requirements and usage of five jobs is shown in above figure. Find maximum worst case blocking time by all the jobs and also mention whether it is direct, priority inheritance or priority ceiling blocking.

Q.5 **(a)** Explain the thread control block and state transition diagram of real time threads. **07**

(b) Explain in brief the structure of microkernel in real time OS. **07**

OR

Q.5 **(a)** What are common capabilities of commercial RTOS. **07**

(b) What is RTLinux? Explain important features of it. **07**

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