

GUJARAT TECHNOLOGICAL UNIVERSITY
ME Semester –I Examination Feb. - 2012

Subject code: 710105N

Date: 21/02/2012

Subject Name: Real Time Computing

Time: 10.30 am – 01.00 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) 1. What do you mean by real time system? What are hard and soft real time systems? **04**
2. Divide following real time systems into hard and soft RTS with proper justification. **03**
- (i) Missile guidance system (ii) Videoconferencing
 (iii) Cellular system
- (b) What do you mean by scheduling of real time tasks? Why simple round robin is not suitable for it? How it is extended? Also define feasible schedule. **07**
- Q.2** (a) By the help of suitable example, explain following **07**
1. What is the effect of priority inversion while accessing common resource among multiple jobs?
 2. How NPCS can control it?
 3. What are pros and cons of NPCS?
- (b) Define any seven temporal parameters of real time task. **07**
- OR**
- (b) Seven jobs with their release time and absolute deadline are as follow. **07**
- J1(2,10) J2(0,7) J3(1,12) J4(4,9) J5(1,8) J6(0,20) J7(6,21).
 Dependencies among them are (J1, J2)→J3, J3→J4, J3→J5, (J4, J5)→J6, (J3, J4)→J7.
 Find effective release time and effective deadline for all jobs.
- Q.3** (a) A system contains three periodic tasks. **07**
- T₁ (5,5,2.5,10) T₂(0,6,1,2) T₃(0,12,2.5,5).
 (i) Make schedule using DM in interval [0, 25] and also indicate missing deadlines (if any).
 (ii) Find total utilization of system.
- (b) 1. Justify the statement. **04**
- LST algorithm is not optimal while scheduling on multiple processors.
2. Differentiate on-line and off-line scheduling with suitable example. **03**
- OR**
- Q.3** (a) A system contains three periodic tasks. **07**
- T₁ (3,1) T₂(5,2) T₃(8,3).
 (i) Make schedule using EDF in interval [0, 25] and also indicate missing deadlines (if any).
 (ii) Find total utilization of system.
- (b) A system contains three periodic tasks. **07**

$T_1(3,1) \quad T_2(4,1) \quad T_3(6,2)$.

Draw network flow graph to prepare preemptive cyclic schedule. (Use frame size=2).

- Q.4 (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**

(i) Suppose that a sporadic job $S_1(1,23)$ arrives in frame 1, $S_2(0.8,16)$ and $S_3(0.5,20)$ arrive in frame 2. In which frames are the accepted sporadic jobs scheduled?

(Where sporadic job $S_n(\text{execution time, absolute deadline})$).

- (b)** Parameters of five jobs are given below. **07**

<i>Job</i>	r_i	e_i	<i>Resource</i>	<i>Demand time of resource</i>	<i>Total usage of resource</i>
J ₁	7	4	R ₁	8	1
J ₂	5	4	R ₂	6	2
J ₃	4	3			
J ₄	2	6	R ₁	3	4
			R ₂	9	1.5
J ₅	0	5	R ₂	1	3

Priorities are in decreasing order from J₁ to J₅. Schedule them according to given priority such that all can complete their execution with priority inheritance resource access control protocol.

OR

- Q.4 (a)** 1. Consider a fixed priority system in which there are five tasks T_i, for i=1, 2, 3, 4, 5 with decreasing priorities. **04**

There are two resources X and Y. The critical sections of T₁, T₂, T₄ and T₅ are [Y;3], [X;4], [Y;5[X;2]] and [X;10] respectively. Find blocking time b_i(rc) of the tasks.

2. Define: (i) Direct blocking (ii) Priority inheritance blocking (iii) Avoidance blocking **03**

- (b)** Parameters of five jobs are given below. **07**

<i>Job</i>	r_i	e_i	<i>Resource</i>	<i>Demand time of resource</i>	<i>Total usage of resource</i>
J ₁	3.5	4	R ₁	4.5	1.5
J ₂	1	4	R ₂	2.5	2
			R ₃	10.5	0.7
J ₃	0	7	R ₃	0.5	4.2
			R ₂	3	2.3

Priorities are in decreasing order from J₁ to J₃. Schedule them according to given priority such that all can complete their execution with priority ceiling resource access control protocol.

- Q.5 (a)** How to find preemption ceiling of a given resource? Write scheduling rule, priority inheritance rule and allocation rule of preemption ceiling protocol. **07**

- (b)** Define: (i) local blocking time (ii) remote blocking time (iii) remote preemption delay (iv) deferred blocking time **07**

OR

- Q.5 (a)** Explain state transition diagram of real time threads. **07**

- (b)** Explain by which features of Windows NT, it is not suitable for real time applications? **07**
