Reg. No.



VII SEMESTER B. TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOVEMBER 2017

SUBJECT: REAL TIME SYSTEMS [ELE 4004]

REVISED CREDIT SYSTEM

Tim	e: 3 Hours	Date: 28 November 2017	Max. Marks	s: 50
Insti	ructions to Candidates:			
	✤ Answer ALL the question	S.		
	 Missing data may be suita 	ably assumed.		
1A.	What is a 'real-time system'? Ex notion of time? For a suitable components of real-time system	xplain how the concept of real-time is different from example, using a block diagram show the impor n. Explain each block and their interactions.	the traditional tant hardware	(04)
1B.	Classify the real-time tasks bas each of them with the help of an	sed on the consequences of a task missing its dead n example.	1-line? Explain	(03)
1C.	A cyclic real-time scheduler is t shown in Table 1C . Suggest a su in your calculations.	to be used to schedule three periodic tasks with the uitable frame size that can be used. Show all the inte	characteristics rmediate steps	(03)
2A.	Check for feasibility of a pre-en Table 2A using analytical cal graphical method.	nptive Rate Monotonic (RM) scheduler used for tas lculations for time demand analysis and verify t	k set shown in he same with	(04)
2B.	Consider a real-time system to Algorithm schedule the tasks is whether all the task meet the do of 50ms and remaining tasks ha	task set shown in Table 2B , using Deadline Mo in the time interval [0 to 250ms]. Draw the time eadline by observing the timeline. Assume only Task ave zero phase and Deadline is relative to the phase	onotonic (DM) ine and check k 1 has a phase	(03)
2C.	Generate an example to show t Earliest Deadline First (EDF) Sc	that if the utilization U>1, then it doesn't imply nor cheduler. Check by scheduling taskset in timeline.	-feasibility for	(03)
3A.	Schedule the task set shown in the time-line [0 to 22ms] of the schedule.	Table 3A using Least Slack Time (LST) Scheduling e schedule. Show all the intermediate steps in your c	method. Show calculations for	(04)
3B.	A real-time system runs with t scheduler. Consider an Aperic e=0.8ms. Schedule the task set For the same task set if a poller Schedule the task set in the tim	task set shown in Table 3B , scheduled with the prodic job arrives at time t=0.1ms and has an execution the timeline and calculate the response time of server with period of 2.5ms and execution budget o eline and calculate response time of Aperiodic job.	re-emptive RM cution time of Aperiodic job. f 0.5ms is used	(03)
3C.	Compare the following resource shortcomings and the advanta Locker Protocol(HLP) and Prior	ce sharing protocols for real-time systems by clea ges of the protocols. Priority Inheritance Protoco rity Ceiling Protocol(PCP)	rly stating the l(PIP), Highest	(03)

4A. A real-time system has four periodic tasks set as shown in Table 4A, scheduled using pre-emptive RM Algorithm. An Aperiodic task of execution time 2ms arrives quite at random once in every 50ms. Design an appropriate deferrable server for the schedule to work effectively. Perform time-demand analysis and check for feasibility of the system with the designed sever.

(04)

- **4B.** A system has four tasks T_1, T_2, T_3 , and T_4 with priority values of the tasks as 10, 7, 5 and 2 respectively. Priority order is given as: $T_1 > T_2 > T_3 > T_4$. The task set requires two critical resource CR1 and CR2 and the duration for which the task requires the resources are shown in **Figure 4B**. Compute different type of inversion that each task might undergo in the worst-case condition. Clearly state the reason for each such computation.
- **4C.** Explain the working of count-down protocol used in real time communication for LAN. With the help of an example explain how high priority message is determined in Count-down protocol. **(03)**
- **5A.** The **Table 5A** shows specifications of set of 10 periodic real-time tasks. Assume that task set need to run on a multiprocessor with four processors and each processor are to be scheduled using RM algorithm. Describe the working of next fit algorithm and allocate the tasks to the processor using next fit algorithm.
- **5B.** Mention the requirements for an operating system to be real-time POSIX standard compliant.
- 5C. A network is designed using IEEE 802.4 protocol and has three nodes. Node 1 needs to transmit 1MB of data every 300ms. Node 2 needs to transmit 1.2MB of data every 500ms. Node 3 needs to transmit 2MB of data every 200ms. Select a suitable Target Token Rotation Time(TTRT) for the network and compute the token holding time for each node. (03)

Task Period(ms)		Execution(ms)	Deadline(ms)		
T1	8	3	8		
T2	7	2	7		
T3	5	1	5		

Table 1C

Table 2A

(03)

(04)

(03)

Deadline(ms)

33

28

29

Task	Period(ms)	Execution(ms)	Deadline(ms)		
T1	3	1	3		
T2	5	1.5	5		
T3	7	1.25	7		

Table 3A

Execution(ms)

10

3

10

Arrival(ms)

0

4

5

Task T1

T2

Т3

Table 2B

Task Period(ms)		Execution(ms)	Deadline(ms)		
T1	50	25	100		
T2	62.5	10	20		
Т3	125	25	50		

Task Period(ms)		Execution(ms)	Deadline(ms)		
T1	3	1	3		
T2	10	4	10		

Task	Period(ms)	Execution(ms)	Deadline(ms)		
T1	5	1	5		
T2	7	0.5	7		
Т3	20	2	20		
<u>T</u> 4	50	10	50		

Tał	ole	5A
Tat	ole	5A

Task	T ₁	T ₂	T ₃	T_4	T_5	T ₆	T_7	T ₈	T 9	T ₁₀
Execution(ms)	5	5	3	1	8	11	1	3	9	17
Period(ms)	10	22	22	24	30	40	50	55	70	75

