

Name _____

Real Time Systems
EE 4770
Final Examination*
12 May 1993, 10:00–12:00

Problem 1 _____ (25 pts)

Problem 2 _____ (25 pts)

Problem 3 _____ (25 pts)

Problem 4 _____ (25 pts)

Alias _____

Exam Total _____ (100 pts)

Good Luck!

The wording of the questions on this exam may have been modified so that they are consistent with terminology used this semester.

Problem 1: A real time system generates five interrupts, as described in the incomplete table below. Complete the table. (25 pts)

Interrupt Name	Strong Priority	Weak Priority	Frequency	Duration	Load	Loading Factor	Loaded Duration	Maximum Duration	Latency
A	1	1	100 kHz	1 μ s					
B	1	2	50 kHz	3 μ s					
C	1	3	30 kHz	5 μ s					
D	2	1	100 Hz	11 μ s					
E	3	1	0.5 Hz	10 ms					

Problem 2: The material for this problem will not be covered in RTS 95 semester.

Problem 3: Design two circuits to measure the radiant flux emitted from a uniformly emitting source.

(a) The first circuit is to have an output with voltage $v_{o1} = \frac{\Phi}{3\text{W}}$ V, where Φ is the radiant flux emitted by the source. Use a photodiode with sensitivity $k_s = 2 \frac{\mu\text{Acm}^2}{\text{mW}}$; specify all other component values, and any other relevant details. (13 pts)

(b) The second circuit should also produce an output voltage $v_{o2} = \frac{\Phi}{3\text{W}}$ V, (where Φ is the radiant flux emitted by the source), however in this case the light source moves. A potentiometer can be used to find the distance between the light source and the photodiode, which can vary between 0.1 and 5 meters. Use the same type of photodiode as above, specify all other component values, and any other relevant details. (Hint: consider inverting amplifiers.) (12 pts)

Problem 4: Briefly answer each of the following.

(a) Explain how an orifice flow meter measures flow rate. Draw a diagram showing all relevant parts, including the sensors. (8 pts)

(b) Consider an interrupt system which, instead of using only priority to determine which ISR runs, also takes into account task completion deadlines. (Thus giving priority to tasks with imminent deadlines.) What is the disadvantage of such a system. (Be specific.) (8 pts)

(c) What is the difference between volumetric flow and mass flow? (5 pts)

(d) What is gauge pressure? (4 pts)

Have a good summer!