Lab #8: Real time scheduling using RMA

An Intertial Navigation System (INS) is a real-time shipboard avionic system. It has strict time constraints for providing information to other shipboard devices. For example, an INS tracks attitude, geographic position, velocity, distance and displacement. You have sketched the top-level design for an INS that has to comply with the following timing constraints:

Feature	**Period (ms)**
Compute attitude data	2.56
Compute velocity data	40.96
Compute position data	1,280.00
Display data	1,000.00
Compose attitude message	61.44
Compose navigation message	1,024.00

Your preliminary design is organized after the timing constraints. You envision six tasks, each one fulfilling one of the timing requirements. You know that the tasks will not be independent. All tasks share the same result table (write mode for computational tasks, read mode for all others). The attitude and navigation message composition tasks share the same I/O channel.

The system will run on a platform using a Motorola MC68302 microcontroller and a linux real-time kernel, which offers a priority ceiling protocol. The overhead for this system is 153 μs per task. You have estimated the execution times and resource usage times for each of the tasks:

Task	**Run time (ms)**	**Result table usage (ms)**	**I/O channel usage (ms)**
attitude	1.30	0.20	-
velocity	4.70	0.20	-
position	3.00	0.20	-
display	23.00	0.30	-
att message	9.00	0.15	3.00
nav message	38.30	0.30	6.00

Is this system schedulable?

Write a program to perform RMA with overhead and blocking. Report your results by providing the values of (k,l) for which the theorem passes, or for which value of (i) the theorem failed. Your report should include a table of the data you used, and your code.

This lab is due by the due date posted at the course website. It must be completed by each individual student. There is to be NO collaboration on this problem.