SPRINTS RTOS COURSE

Designing a real-time system

Task Report

Prepared By :

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•Task: Design a healthcare system using RTOS with the following requirements:

▪A touch LCD as input that can control the system and give commands. Every LCD command is represented in 4 bytes. LCD is connected to the micro-controller through UART with speed 9600 bps [Bit per second]. (Reading 4 bytes and processing the command takes 2 ms)

▪Blood pressure sensor with new data every 25ms. (Reading the sensor and processing its data takes 3 ms)

▪Heart beat detector with new data every 100ms. (Reading the sensor and processing its data takes 1.5 ms)

▪Temperature sensor with new data every 10ms. (Reading the sensor and processing its data takes 2.5 ms)

▪Alert siren. (Activate or Deactivate the siren takes 1 ms)Tasks

[1] Decide how many tasks are needed ?

→ 5 tasks

[2] Decide task parameters (periodicity _ Deadline)

Task1 (LCD_Reading_Command)

Executim time = 2ms periodicity = 10ms

Task2 (Blood_pressure_sensor_reading)

Executim time = 3ms periodicity = 25 ms

Task3 (Heart_Beat_Sensor_Reading)

Executim time = 1.5 ms periodicity = 100 ms

Task4 (Temperature_Sensor_Reading)

Executim time = 2.5 ms periodicity = 10 ms

Task5 (Alert_siren)

Executim time = 1ms periodicity = 10 ms

[3] Decide system tick rate

→ tick rate = total of all execution time of all tasks

= 2+3+1.5+2.5+1 = 10ms

[4] Calculate Hyperperiod

→ Hyperperiod = least common multiplier of all tasks

= 100 ms

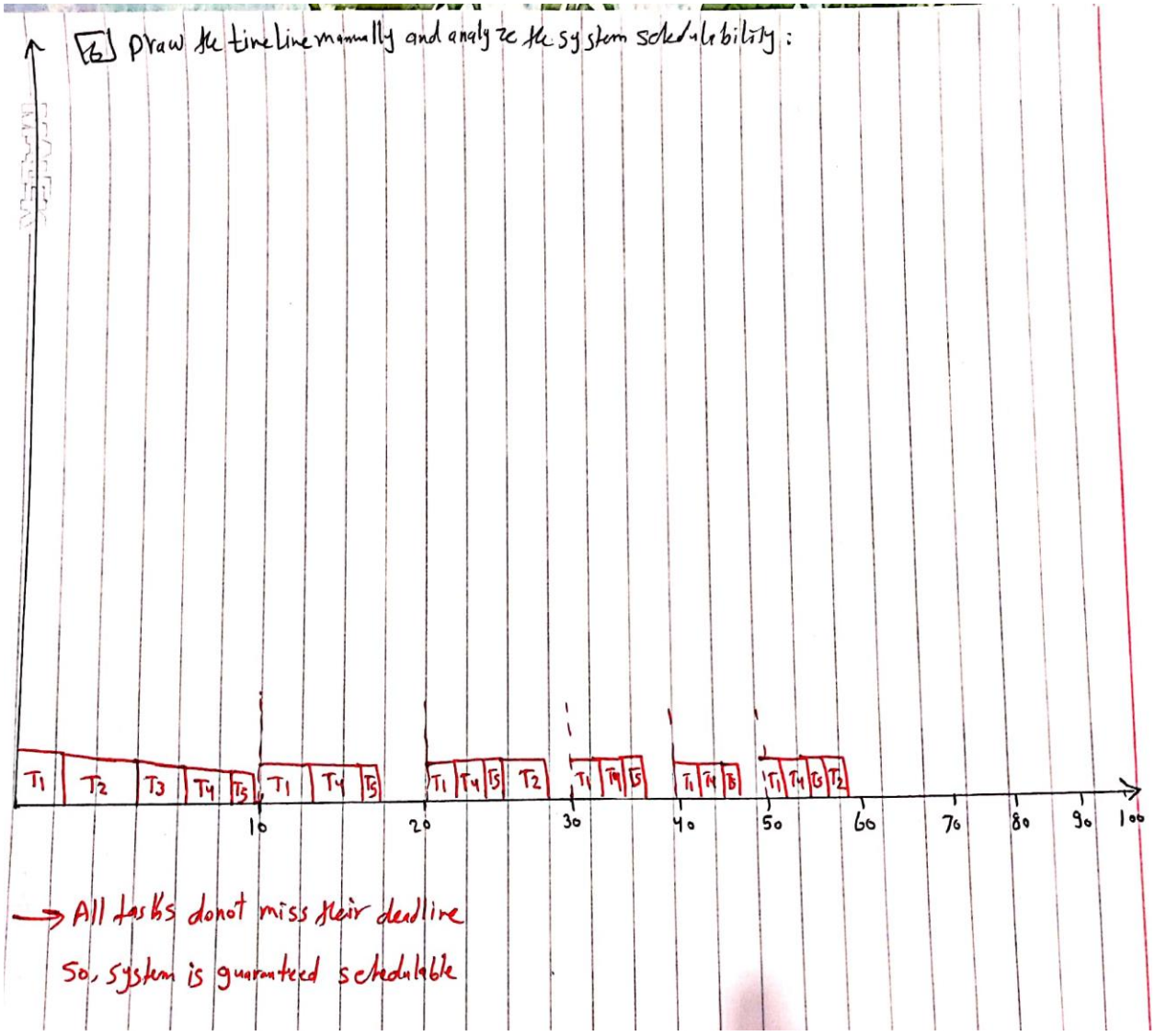
[5] Calculate cpu load

$$\text{Cpu load} = \sum \frac{\text{execution time of each task}}{\text{period of task}}$$

$$= \frac{2}{10} + \frac{3}{25} + \frac{1.5}{100} + \frac{2.5}{10} + \frac{1}{10} = 0.685 = 68.5\ \%$$

→ Cpu load is not high, so we can add features in system

[b] draw the timeline manually and analyze the system schedulability:



→ All tasks donot miss their deadline

So, system is guaranteed schedulable

Model The System Using Simso :

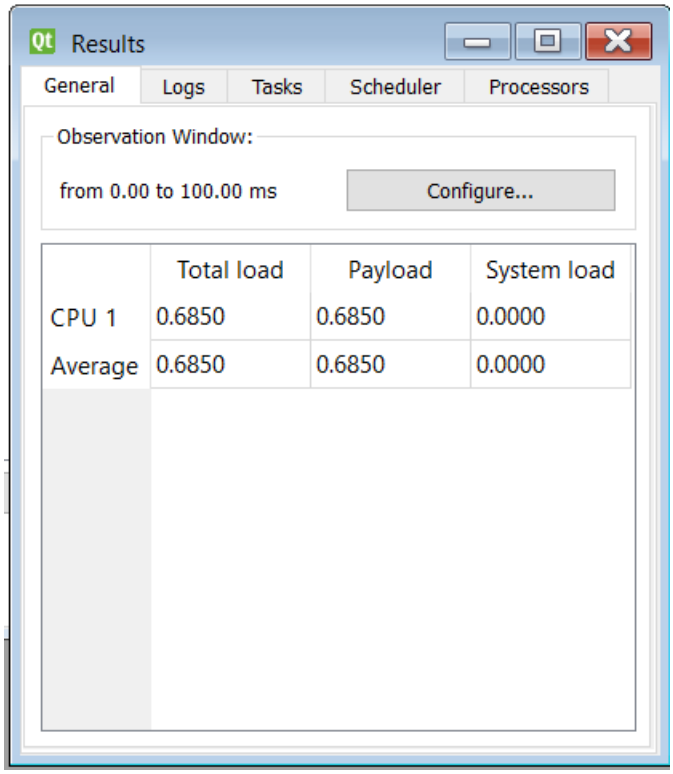
1- Tasks List

Model data

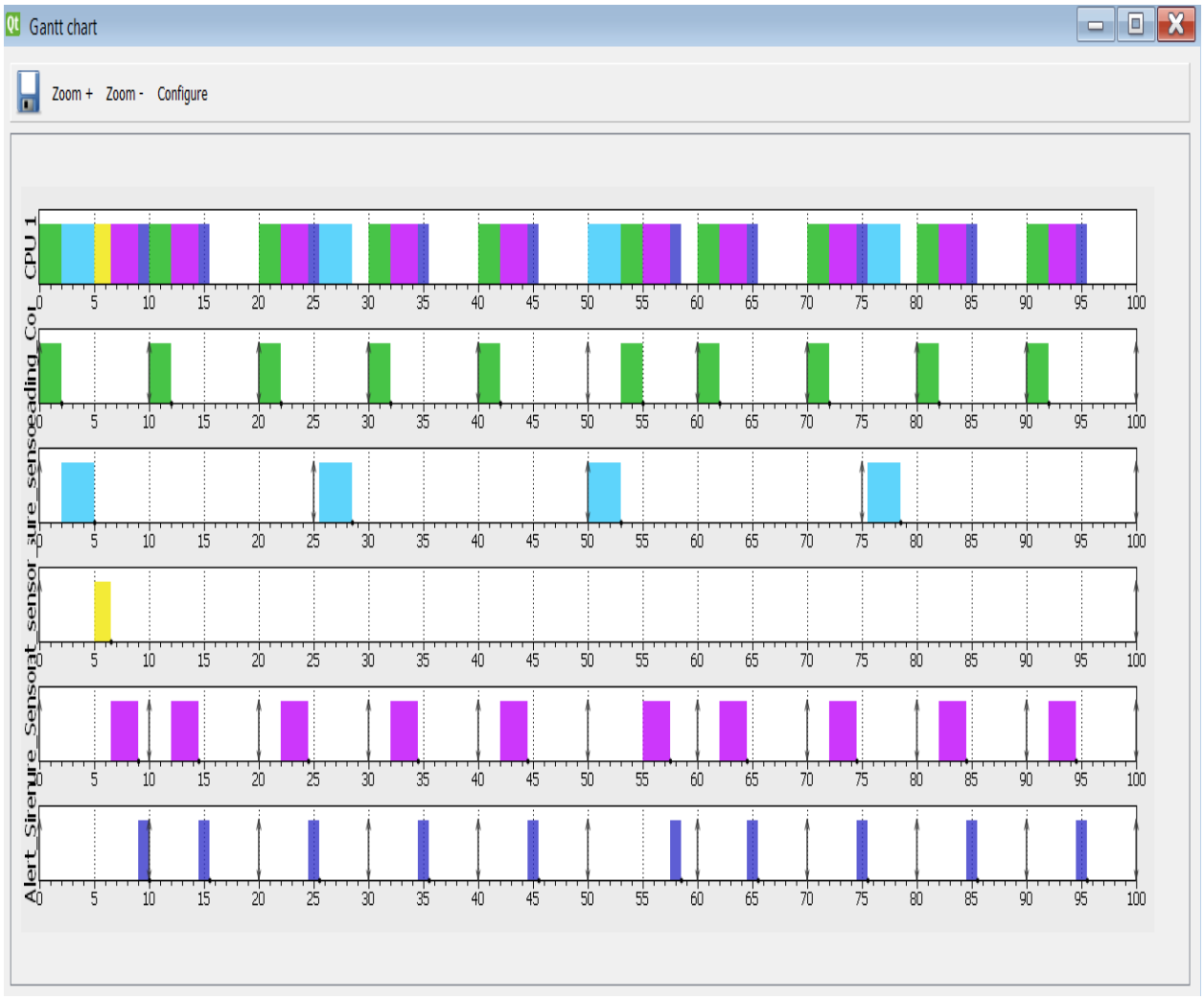
General | Scheduler | Processors | Tasks

id	Name	Task type	Abort on miss	Act. Date (ms)	Period (ms)	List of Act. dates (ms)	Deadline (ms)	WCET (ms)	Followed by	priority
1	LCD_Reading_Command	Periodic	☑ Yes	0	10	-	10	2.0		0
2	Bloodpressure_sensor_Reading	Periodic	☑ Yes	0	25	-	25	3		0
3	heartbeat_sensor_Reading	Periodic	☑ Yes	0	100	-	100	1.5		0
4	Temperature_Sensor_Reading	Periodic	☑ Yes	0	10	-	10	2.5		0
5	Alert_Siren	Periodic	☑ Yes	0	10	-	10	1		0

Cpu Load



Gantt Chart



My Calculations Match Simso Analysis Computation and System Is Guaranteed Schedulable.