Tirth V Patel , 20043537 8.

ENSE = 452 Assignment :- 3

Q-1]

Given,

Task 1 : Period = 10ms , WCET = 4ms
Task 2 : Period = 39 ms , WCET = 12 ms
Task 3 : period : 1s = (1000ms) , WCET = 98 ms

↳ Total time loading :-

$$U = \frac{C_1}{T_1} + \frac{C_2}{T_2} + \frac{C_3}{T_3}$$

C_i = WCET
T_i = Period

$$U = \frac{4}{10} + \frac{12}{39} + \frac{98}{1000}$$

$$U = 0.4 + 0.3077 + 0.098$$

$$\boxed{U = 0.8057}$$

* feasibility of the Task set can be calculated

$$U_{RMS} = n\left(2^{1/n} - 1\right)$$

n = number of task

$$U_{RMS} = 3\left(2^{1/3} - 1\right)$$

$$= 3(0.2599)$$

$$\boxed{U_{RMS} \approx 0.780}$$

since total Utilization $U > U_{RMS}$, the task set is not guaranteed to be schedulable Under Rms.

* To make the task set Schedulable Under RMS, We need to reduce the total Utilization.

→ The Simplest way to do this is to increase the period of one or more tasks.

→ Since task T_1 has highest Utilization, Let's increase it's period.

Let's assume T_1 Period is 12 ms.

$$U_{Task_1} = \frac{4}{12} = 0.33\bar{3}$$

So, NOW total Utilization

$$U = 0.333 + 0.3077 + 0.098$$

$$\boxed{U = 0.7387} < U_{RMS}.$$

So now the task set ~~would~~ would be Schedulable.

2]

we are given,

	cycle	Execution Time	Priority
Task A :	10ms	4ms	3
Task B :	20ms	5ms	1
Task C :	40ms	10ms	2
idle :	Continuous	5ms	—

a]

1] System utilization:-

$$U = \frac{C_A}{T_A} + \frac{C_B}{T_B} + \frac{C_C}{T_C}$$

$$= \frac{4}{10} + \frac{5}{20} + \frac{10}{40}$$

$$U = 0.4 + 0.25 + 0.25$$

$$\boxed{U = 0.9} \quad \text{or} \quad \boxed{90\%}$$

2] task set is schedulable under RMS, if

$$U \leq n\left(2^{1/n} - 1\right)$$

for 3 tasks,

$$U_{RMS} = 3\left(2^{1/3} - 1\right) \approx 0.7797$$

$$\approx 0.780$$

since $U\ (0.9) > U_{RMS}\ (0.780)$, this task set is <u>not schedulable under RMS</u>.

3]

Task A has highest priority.

So,

$$R_A = C_A = 4ms$$

Task C response time = 4ms + 10ms
= 14 ms

Task B Respone time = 4ms + 10ms + 5 ms
= 19 ms

4] deadline meeting.

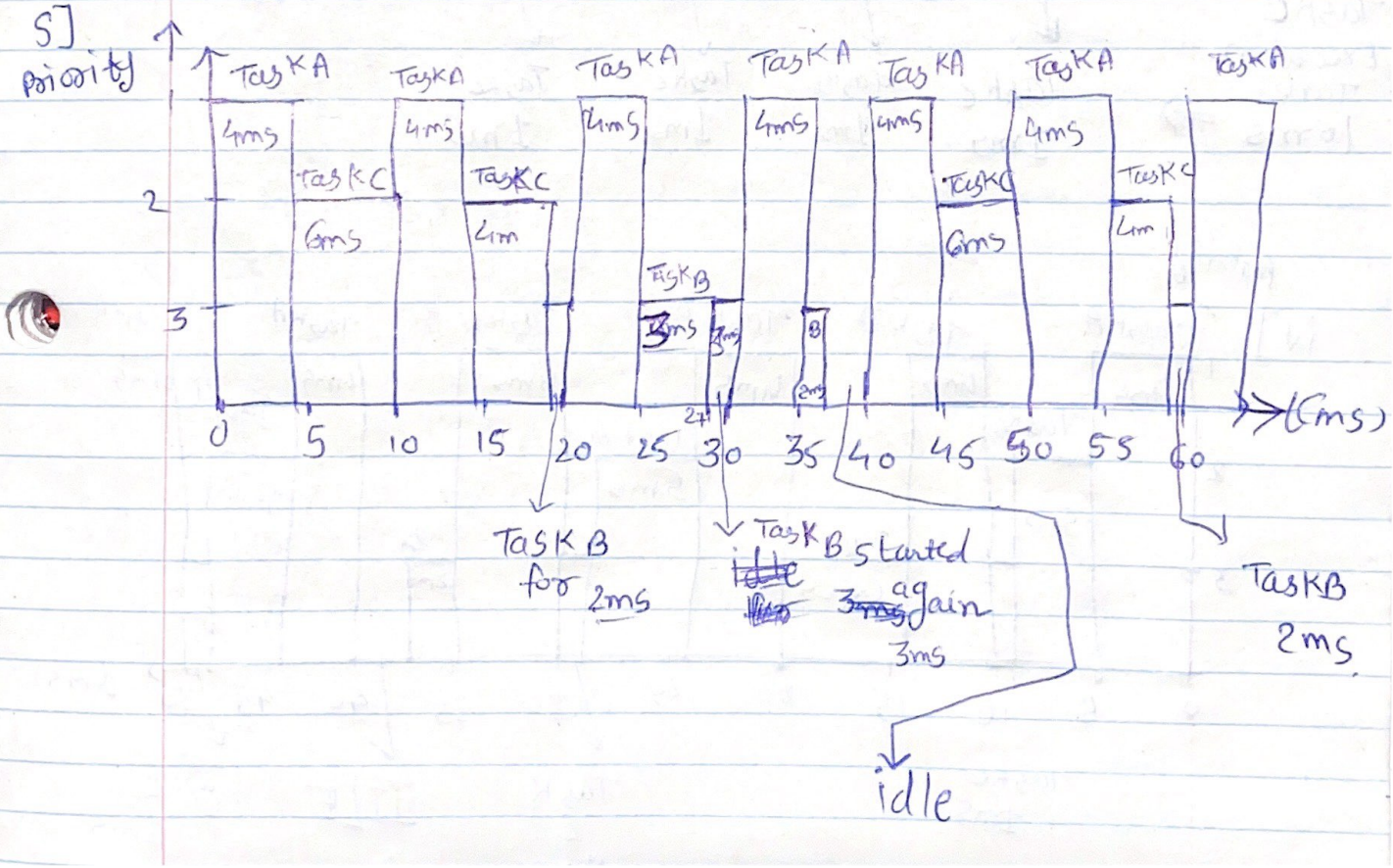
→ Task A Deadline = 10ms and
response time = 4ms, so
Meets deadline by 6ms.

→ Task B Deadline = 20ms and
response time = 19 ms.
Meets deadline by 1ms.

→ Task C Deadline = 40ms and
response time = 14 ms.
So, Meets it's deadline by 26 ms.

All task Meet their deadlines.

5]


priority
2
3
Task A
4ms
Task C
6ms
4m
Task B
3ms
2ms
0
5
10
15
20
25
27
30
35
40
45
50
55
60
(ms)
Task B for 2ms
Task B started again 3ms
idle
Task B 2ms

Part : b]

i] System utilization $U = 0.9$ ... remains same.

ii] Response times,

Task A, highest priority, response time = 4ms

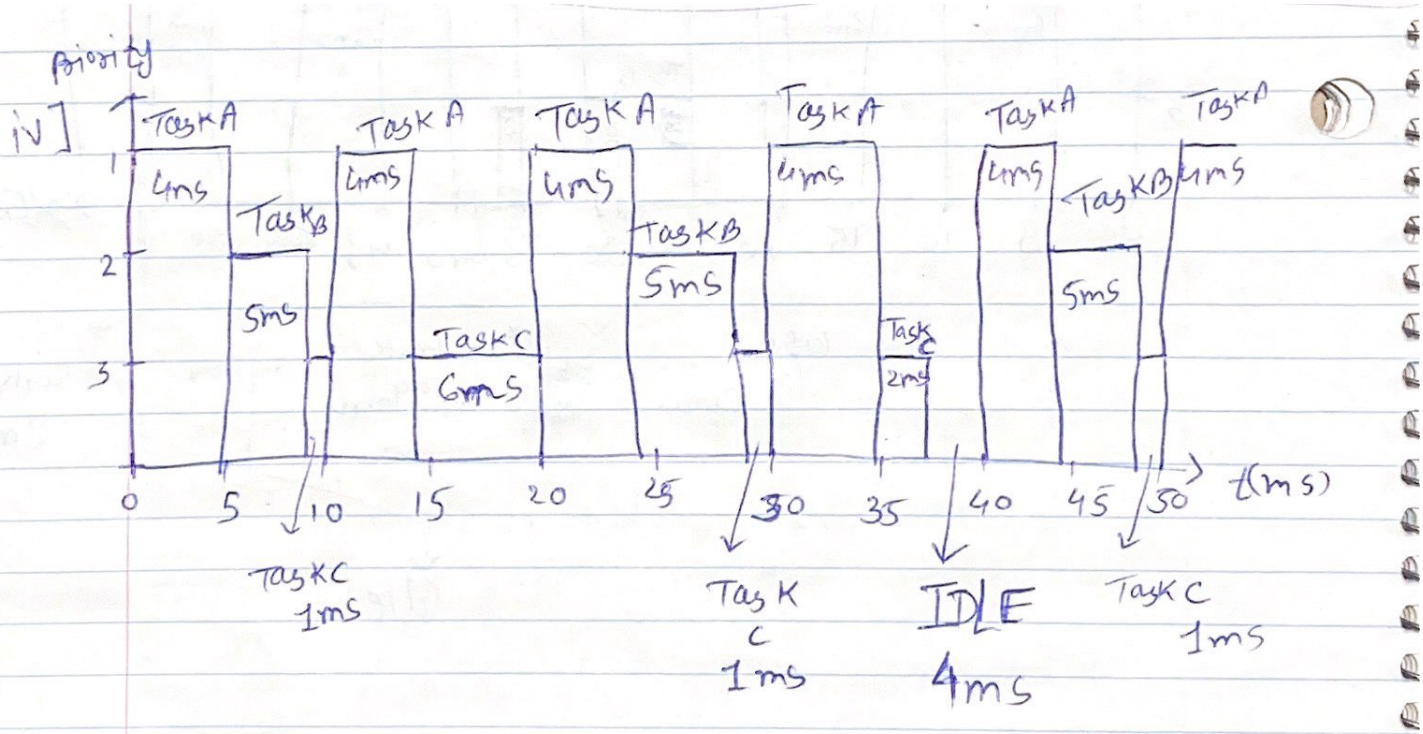
Task B, middle priority, response time:
4 + 5 ms
= 9 ms

Task C, lowest priority, response time,
4 + 5 + 10 = 19 ms

iii] Task A, deadline = 10ms, Completes in 4ms
so, meets deadlines by 6ms.

Task B, deadline = 20ms, Completes at 9ms.
so, meet deadlines by 11ms.

Task C deadline = 40ms, Completes at 19ms.
meets deadline by 21ms.


Priority
(V)
Task A
4ms
Task B
5ms
Task C
6ms
2ms
1
2
3
0
5
10
15
20
25
30
35
40
45
50
t(ms)
Task C
1ms
Task C
1ms
IDLE
4ms
Task C
1ms