SOTR 22/23
Exame

I.

1) Yes, it affects the execution time, which will depend on the condition.

E.g.

```
compute 1
   ⋮
compute n        ] C1
if (cond) {
    compute T.1
      ...   T.n     C2.1
} else {
    compute F.1
       ⋮    F.n     C2.2
}
cont ...            C3
```

$C = C_1 + C_{2.1} + C_3$

or

$C = C_1 + C_{2.2} + C_3$

depends on cond!

2) EDF is more "democratic" and high freq. tasks can suffer more jitter.

RM gives high prio to HF tasks, so it is better!

3) a) In all cases tasks are not ready for execution

b) Idle: terminated job

Blocked: access to shared resource

Suspended: wait for some event (e.g. timer)

4 -
Advantage of DS over PS: response time
Justification: PS executes periodically. A request that arrives after an execution must wait one period. DS executes at any time, if it has capacity.

Advantage of PS over DS: impact on schedulability.
Justification: PS has a load equivalent to a periodc task, but DS has an higher load (e.g. back-to-back execution).

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II. 1

a) $U = 1/3 + 3/10 + 7/30 \approx 86.7\%$

$U_{lub}(3) = 3(2^{1/3}-1) \approx 80\%$ 80% < 86,7%
ʃ-del

$\prod_{i=1} \left(\frac{e_i}{T_i}+1\right) < 2$?

$2.13+8 < 2 \Rightarrow$ No - I-el

not possible!

d) $R^{wc}_3 = ??$

$R^{wc}_3(0) = c_1+c_2+c_3 = 11$

$R^{wc}_3(1) = \lceil \frac{11}{3} \rceil \cdot 1 + \lceil \frac{11}{10} \rceil \cdot 3 + 7 = 4 + 6 + 7 = 17$

$R^{wc}_3(2) = 6 + 6 + 7 = 19$

$R^{wc}_3(3) = 7 + 6 + 7 = 20$

$R^{wc}_3(4) = 7 + 6 + 7 = 20$) $R^{wc}_3 = 20$ t.u.

e) $B_3 = 0$, as it is the l.p. task.

c_i	$T_i = D_i$
1	3
3	10
7	30

$L_3(0) = 11$

$L_3(1) = \lceil \frac{11}{3} \rceil \cdot 1 + \lceil \frac{11}{10} \rceil \cdot 3 + \lceil \frac{11}{30} \rceil \cdot 7$

$L_3 = 20$

$K_3 = \lceil \frac{20}{30} \rceil = 1$

$s^{(0)}_{3,1} = 0 + c_1 + c_2 = 4$

$s_{3,1}(1) = 0 + 0 + \left(\lfloor \frac{4}{3} \rfloor + 1\right) + \left(\lfloor \frac{4}{10} \rfloor + 1\right) \cdot 3 = 2 + 3 = 5$

$s_{3,1}(2) = 2 + 3 = 5$
conv

$f_{3,1} = 5 + 7 = 12$ $WCRT_3 = f_{3,1} - a_{3,1} = 12 - 0 = 12$ //

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II. 2

z_i	c_i	T_i
1	2	10
2	4	12
3	20	60

a) SBP

$L(0) = 2+4+20 = 26$

$L(1) = \lceil \frac{26}{10} \rceil \cdot 2 + \lceil \frac{26}{12} \rceil \, 4 + \lceil \frac{26}{60} \rceil \cdot 20 = 6+12+20 = 38$

$L(3) = 8+16+20 = 44$

$L(4) = 10+16+20 = 46$)
$L(5) = 10+16+20 = 46$) Como SBP = 46

b) $S = ?$ z_1: 10, 20, 30, 40, ~~50~~ ...
z_2: 12, 24, 36, ~~48~~) $S = \{10, 12, 20, 24, 30, 36, 40\}$
z_3 ~~60~~

30%

$h(10) = 1 + \lfloor \frac{10-10}{10} \rfloor \cdot 2 + 1 + \lfloor \frac{10-12}{12} \rfloor \cdot 4 + 1 + \lfloor \frac{10-60}{60} \rfloor \cdot 20$

$= 2 + 0 + 0 = 0$

$h(12) = 2 + 4 + 0 = 6$

70%

$h(20) = 4 + 4 + 0 = 8$

$h(24) = 4 + 8 + 0 = 12$ ~~$\forall t \in S$, $h(t) \leq t$~~

$h(30) = 6 + 8 + 0 = 14$

$h(36) = 6 + 12 + 0 = 18$

$h(40) = 8 + 12 + 0 = 20$

c) $\forall t \in S$, $h(t) \leq t$ logo é escalonável.

d) $U = 2/10 + 4/12 + 20/60 \simeq 0,87$ Otim C

$U_s = 1 - 0,87 \simeq 0,13$ -20 ... -40%

P/ minimizar NT → p: $c_s = 2$ (worst case)

$U = \frac{C_s}{T} \Rightarrow T = \frac{C_s}{U} = 15,38 \to 16$

CS: $C = 2$; $T = 16$ a

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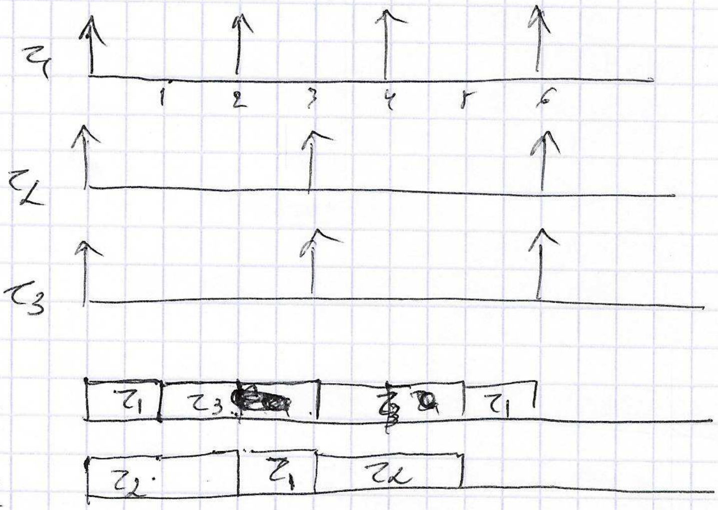
a) $U = \frac{1}{2} + \frac{2}{3} + \frac{2}{3} = 1.833 > 1$ logo é escalonável

b)



Feasible schedule (e.d.f.)

c) Partition scheduling → Allocation a pair

P_1:	1,2	1,3	2,3
P_2	3	2	1

$U_{1,2} = 1.17$ ✗ $U_{1,3} = 1.17$ ✗ $U_{2,3} = 1.33$ ✗

No two tasks can be allocated to a single processor. Not schedulable!!!