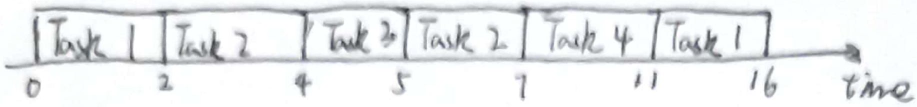
Q1.

(i) $M = LLM(P_i) = LLM(20, 100, 250) = 500$

(ii)



sequence: Task 3, Task 2, Task 4, Task 1.

(iii) Task 3: waitting time : 0

Task 2: waitting time : 1

(iv) parallel: ~~$R(t) = e^{-xt} = e^{-0.8t}$~~

overall: $R(t) = 1 - [(1-0.8)\cdot(1-0.8)\cdot(1-0.8)] = 0.992$

Assume there are n devices, each realibility is: $r(t) = 0.8^3$

$R'(t) = 1 - (1 - r(t))^n \geq R(t)$

$\Rightarrow n \geq 6.73$.

So, at least 7 devices

(v)

Task ID.	response time	waitting time
1	3	0
2	5	2
3	6	3
4	7	4
5	8	5

~~ave W = $\frac{3+6+9+12+15}{5} = 9$~~   average waitting time $= \frac{0+2+3+4+5}{5} = 2.8$

Q. 1

(Vi) 3 tasks, LL bound: $3 \times (2^{\frac{1}{3}} - 1) = 0.7798$

$\sum_{i=1}^{3} u_i = \frac{20}{100} + \frac{30}{150} + \frac{90}{200} = 0.85 >$ LL bound.

Not schedulable.

(Vii) No, in some algorithm, thread cannot modify context directly.

~~Ye~~ For kernel, Yes.

(Viii) ① Mutual exclusion ② Hold & wait ③ No preemption.

Bankers : Hold & wait.

there's no ~~chase~~ circular wait.

(iX) P(0) and P(1) may set "flag = True" at the same time,

the code will ~~stop~~ block at "while(flag[1]);"

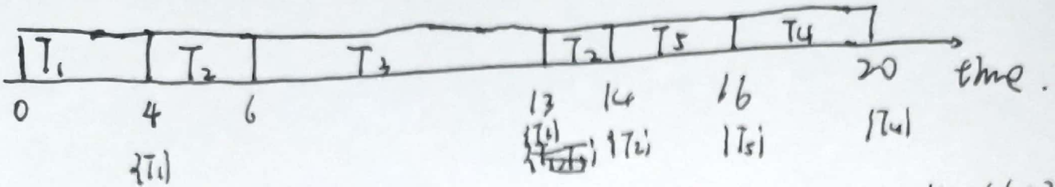
(X) It's an off-line. algorithm

Braetleys algorithm.

Q.2

(i)

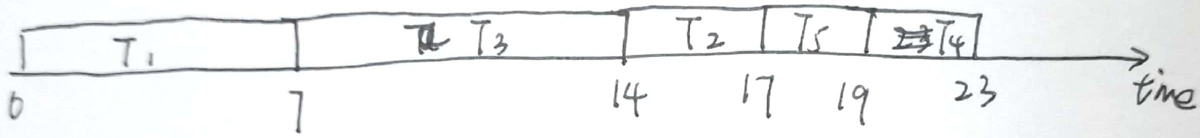
(a)



~~average waiting time = $\frac{\sum(\text{wait time})}{5}$ = $\frac{4+13+14+16+20}{5}$ = 13.4~~

average waiting time $= \frac{0+11+0+5+2}{5} = \cancel{2.8}\ 3.6s$

(b)



average waiting time $= \frac{0+14+0+5+8}{5} = 5.4s.$

although we only add e_1 from $4 \rightarrow 7$, 去 the verrate waiting time is not increase $\frac{7-4}{5} = 0.6s.$ rather than $5.4-3.6 = 1.8s$

(ii) EDF.

~~易~~ 可 $T_i = LCM(P_i)$.

Q.3

(i) $T_1 = (10, 20)$, $T_2 = (20, 60)$, $T_3 = (30, 180)$

(execution time, periodic).

$$U = \sum_{i=1}^{3} \frac{e_i}{p_i} = \frac{10}{20} + \frac{20}{60} + \frac{30}{180} = 1.$$

(ii) Bound 1: $\sum_{i=1}^{3} u_i = \frac{5}{10} + \frac{12}{60} + \frac{20}{100} = 0.9 < 1$ ✓

LL ~~A~~ bound: $3 \times (2^{\frac{1}{3}} - 1) = 0.7798 > \sum_{i=1}^{3} u_i$ ×.

so RMA and DMA no feasible.

~~for DMA: we use $p \leq d$~~.

(iii) select period of the T_3..

assign $p_3 = 300$. , the DMA is schedulable.

$$\sum_{i=1}^{3} u_i = \frac{5}{20} + \frac{12}{60} + \frac{20}{300} = 0.767 < 0.7798.$$

Q.5

(i) Success $= Pr(5\text{ success}) + Pr(4\text{ success}, 1\text{ fail})$

$$\cancel{= \binom{5}{4} 0.995^{4} (1-0.995)^{5-4} + t}$$

$$= 0.995^5 + \binom{5}{4} \cdot 0.995^4 (1-0.995)$$

$$= 0.99975$$

(ii) $\lambda = 0.002$

$f(t) = \lambda \cdot e^{-\lambda t}$.

$\cancel{R(t) = 1 - F(t) =}$

$R_1(t) = \int_t^\infty f(t) = e^{-\lambda t} = e^{-0.002t}$, because there are 2 CPUs.

$R(t) = 1-(1-R_1(t))\cdot(1-R_1(t)) = 2e^{-\lambda t} - e^{-2\lambda t}$

where, $t = 200$, $\lambda = 0.002 \Rightarrow$. $\cancel{R(t) = 0.67}$.

$R(t) = 0.8913$.

(iii) $R(t) = \int_t^\infty f(t) = \int_t^\infty 0.2e^{-0.2t} = e^{-0.2t}$

$$\lambda(t) = -\frac{dR(t)}{d(t)} \cdot \frac{1}{R(t)} = 0.2e^{-0.2t} \cdot \frac{1}{e^{-0.2t}} = 0.2$$