

310554031 葉詠富 數據所

1.

$$a. \frac{2}{10} + \frac{2}{12} + \frac{3}{15} = \frac{1}{5} + \frac{1}{6} + \frac{1}{5} = 0.2 + 0.167 + 0.2 = 0.567$$

$$U(3) = 3 \times (2^{\frac{1}{3}} - 1) = 0.779$$

$\therefore 0.567 \leq U(3) \therefore$ 可以排程

$$b. \frac{2}{10} + \frac{4}{12} + \frac{5}{15} = \frac{1}{5} + \frac{1}{3} + \frac{1}{3} = 0.2 + 0.33 + 0.33 = 0.866$$

$$U(3) = 0.779$$

$\therefore 0.866 > U(3) \therefore$ 不一定可以排程

2.

$$a. T_1: R_0: 2 \leq 10 \text{ ok.}$$

$$T_2: R_0: 2 + 2 = 4 \leq 12 \text{ ok.}$$

$$R_1: 2 \times \lceil \frac{4}{10} \rceil + 2 \times \lceil \frac{4}{12} \rceil = 2 + 2 = 4 \leq 12 \text{ ok}$$

$$T_3: R_0: 2 + 2 + 3 = 7 \leq 15 \text{ ok.}$$

$$R_1: 2 \times \lceil \frac{7}{10} \rceil + 2 \times \lceil \frac{7}{12} \rceil + 3 \times \lceil \frac{7}{15} \rceil = 2 + 2 + 3 = 7 \leq 15 \text{ ok.}$$

$$R_2: 2 \times \lceil \frac{7}{10} \rceil + 2 \times \lceil \frac{7}{12} \rceil + 3 \times \lceil \frac{7}{15} \rceil = 2 + 2 + 3 = 7 \leq 15 \text{ ok.}$$

\therefore 可以排程.

$$b. T_1: R_0: 2 \leq 10 \text{ ok.}$$

$$T_2: R_0: 2 + 4 = 6 \leq 12 \text{ ok.}$$

$$R_1: 2 \times \lceil \frac{6}{10} \rceil + 4 \times \lceil \frac{6}{12} \rceil = 2 + 4 = 6 \leq 12 \text{ ok}$$

$$T_3: R_0: 2 + 4 + 5 = 11 \leq 15 \text{ ok.}$$

$$R_1: 2 \times \lceil \frac{11}{10} \rceil + 4 \times \lceil \frac{11}{12} \rceil + 5 \times \lceil \frac{11}{15} \rceil = 4 + 4 + 5 = 13 \leq 15 \text{ ok}$$

$$R_2: 2 \times \lceil \frac{13}{10} \rceil + 4 \times \lceil \frac{13}{12} \rceil + 5 \times \lceil \frac{13}{15} \rceil = 4 + 8 + 5 = 17 > 15 \text{ fail} \therefore \text{不可以排程}$$

3.

a. $\frac{2}{10} + \frac{2}{12} + \frac{3}{15} = 0.567 \leq 1 \quad \therefore \text{可以排程}$

b. $\frac{2}{10} + \frac{4}{12} + \frac{5}{15} = 0.866 \leq 1 \quad \therefore \text{可以排程}$

4.

Ans: 1. A critical instance of a task T_i occurs when its job $J_{i,c}$ and a job from every higher-priority task are all released at the same time.

2. EDF 和 RM 一樣。

3. critical instance 是最難完成的 case, the interference from high-priority task in the first period of T_i is never larger than $\sum_{j < i} C_j \lceil \frac{P_i}{P_j} \rceil$

7.

NPCS

CPP

$$T_1: 2$$

$$T_1: 0$$

$$T_2: 2$$

$$T_2: 1.5$$

$$T_3: 2$$

$$T_3: 2$$

$$T_4: 0$$

$$T_4: 0$$

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PCP

Direct

Priority-I-b

priority-c-b

	T_2	T_3	T_4	T_2	T_3	T_4	T_2	T_3	T_4
T_1									
T_2			1.5						
T_3			2		1.5			1.5	

$$T_1: 0$$

$$T_2: 1.5$$

$$T_3: 2$$

$$T_4: 0$$

#

8.

$$\frac{1+2}{6} = 0.5 \leq U(1) = 1 \quad \text{OK}$$

$$\frac{2}{6} + \frac{1+1}{8} = 0.33 + 0.25 = 0.58 \leq U(2) = 0.83 \quad \text{OK}$$

$$\frac{2}{6} + \frac{1}{8} + \frac{0+2}{20} = 0.33 + 0.125 + 0.1 = 0.555 \leq U(3) = 0.78 \quad \text{OK}$$

$\therefore \text{可以排程}$

9.

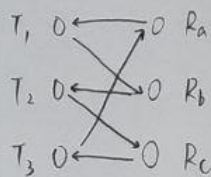
$$\frac{1+2}{6} = 0.5 \leq U(1) = 1 \quad \text{ok}$$

$$\frac{2}{6} + \frac{1+1}{8} = 0.33 + 0.25 = 0.58 \leq U(2) = 0.83 \quad \text{ok}$$

$$\frac{2}{6} + \frac{1}{8} + \frac{0+2}{20} = 0.33 + 0.125 + 0.1 = 0.555 \leq U(3) = 0.78 \quad \text{ok}$$

∴ 其實和 第8題算法一樣
可以排程

10.



如右圖情況

如果用 RM 排程會 circular waiting 而發生 dead lock

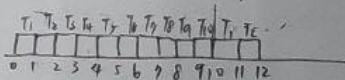
但如果用 PCP 會避免 dead lock

例如: T_2 拿到 R_b 後, 就不可能再拿 R_c , 因為 system ceiling, 所以就破除 circular waiting!

5.

$T_1: (1, 10)$ $T_6: (1, 10)$
 $T_2: (1, 10)$ $T_7: (1, 10)$
 $T_3: (1, 10)$ $T_8: (1, 10)$
 $T_4: (1, 10)$ $T_9: (1, 10)$
 $T_5: (1, 10)$ $T_{10}: (1, 10)$

用 RM 排可以排程



但用 utilization bound 算

$$0.1 + 0.1 + 0.1 + 0.1 + 0.1 + 0.1 + 0.1 + 0.1 + 0.1 + 0.1 = 1 > U(10) = 0.91 \quad \text{fail}$$

6. disprove:

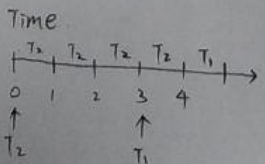
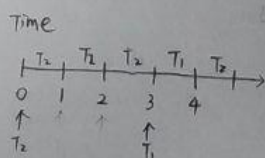
$T_1: (1, 5)$

$T_2: (4, 7)$

這邊假設:

T_2 在時間點 0 到

T_1 在時間點 3 到



如果用 RM 排程, 在時間 3 時,

因為 T_1 priority 較高, 所以會 preemption T_2
 所以 preemption 次數 1 次

但如果用 EDF 排程, 在時間 3 時

因為 T_1 deadline = 8, T_2 deadline = 7

所以繼續做 T_2 ,

所以 preemption 次數 0 次

所以在「固定時段內」, 不定 EDF 永遠 preemption > RM