

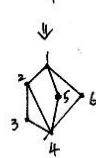
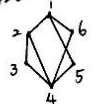
# 機構設計 HW6 參考

## HW6 :

(1)

1. Find  $C_p(A)$  of graph #20 and 25 in P.4-15 by inspection.

Ans: #20



$N=6$

$$C_p = P_0 X^6 + P_1 X^5 + P_2 X^4 + P_3 X^3 + P_4 X^2 + P_5 X^1 + P_6$$

$$P_0 = 1, P_1 = 0$$

$$P_2: \text{loop} : P_2 = -8$$

$$P_3: \text{triangle} : 2-3-4 \Rightarrow P_3 = -2 \times 1 = -2$$

$$P_4: \text{square} : \begin{matrix} 1-2-3-4 \\ 2-3-4-5 \\ 1-2-3-4 \end{matrix} = -2 \times 3 = -6$$

$$\text{loop} : 1-2 \begin{Bmatrix} 3-4 \\ 4-5 \\ 4-6 \end{Bmatrix} - 2-3 \begin{Bmatrix} 1-5 \\ 4-5 \\ 1-6 \\ 4-6 \end{Bmatrix} - 3-4 \begin{Bmatrix} 1-2 \\ 1-5 \\ 1-6 \end{Bmatrix} - 4-5 \begin{Bmatrix} 1-2 \\ 2-3 \\ 1-6 \end{Bmatrix} - 1-5 \begin{Bmatrix} 2-4 \\ 2-3 \\ 3-4 \\ 4-6 \end{Bmatrix} - 4-6 \begin{Bmatrix} 1-2 \\ 2-3 \\ 1-5 \end{Bmatrix} - 2-4 \begin{Bmatrix} 1-5 \\ 1-6 \end{Bmatrix} - 1-6 \begin{Bmatrix} 2-3 \\ 3-4 \\ 2-4 \\ 4-5 \end{Bmatrix}$$

$$\frac{1}{2} \times 26 = 13$$

$$P_4 = -6 + 13 = 7$$

$$P_5: \text{pentagon} : 1-2-3-4-5, 1-2-3-4-6 : -2 \times 2 = -4$$

$$\Rightarrow P_5 = -4 + 4 = 0$$

$$\text{triangle} : 2 : \Rightarrow 2 \times 2 = 4$$

$$P_6: \text{hexagon} : 0$$

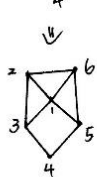
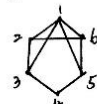
$$\text{loop} : 1 : \Rightarrow 2 \times 1 = 2$$

$$\text{triangle} : 0$$

$$\text{loop} : 2-3 \& 1-5 \& 4-6, 2-3 \& 1-6 \& 4-5 \Rightarrow -1 \times 2 = -2 \Rightarrow P_6 = 2 - 2 = 0$$

$$\Rightarrow C_p = X^6 - 8X^4 - 2X^3 + 7X^2$$

#25



$$C_p = P_0 X^6 + P_1 X^5 + P_2 X^4 + P_3 X^3 + P_4 X^2 + P_5 X^1 + P_6$$

$$P_0 = 1, P_1 = 0$$

$$P_2: \text{loop} : P_2 = -9$$

$$P_3: \text{triangle} : -2 \times 3 = -6$$

$$P_4: \text{square} : \begin{matrix} 1-2-3-4 \\ 2-3-4-5 \\ 1-2-3-4 \end{matrix} = -2 \times 3 = -6$$

$$\text{loop} : 1-2 \begin{Bmatrix} 3-4 \\ 4-5 \\ 5-6 \end{Bmatrix} - 1-3 \begin{Bmatrix} 2-6 \\ 5-6 \\ 4-5 \end{Bmatrix} - 1-5 \begin{Bmatrix} 2-4 \\ 2-3 \\ 2-6 \end{Bmatrix} - 1-6 \begin{Bmatrix} 2-3 \\ 3-4 \\ 4-5 \end{Bmatrix} - 2-3 \begin{Bmatrix} 1-5 \\ 1-6 \\ 5-6 \end{Bmatrix} - 2-6 \begin{Bmatrix} 1-3 \\ 2-6 \\ 3-4 \\ 4-5 \end{Bmatrix} - 3-4 \begin{Bmatrix} 1-5 \\ 1-6 \\ 5-6 \end{Bmatrix} - 4-5 \begin{Bmatrix} 1-2 \\ 1-3 \\ 1-6 \\ 5-6 \end{Bmatrix} - 5-6 \begin{Bmatrix} 1-2 \\ 1-3 \\ 2-6 \end{Bmatrix}$$

$$\frac{1}{2} \times 34 = 17$$

$$P_4 = -6 + 17 = 11$$

$$P_5: \text{pentagon} : 1-2-3-4-5, 1-3-4-5-6, 2-3-4-5-6, 1-3-2-5-6 : -2 \times 4 = -8$$

$$\text{triangle} : 1-2-6 \begin{Bmatrix} 3-4 \\ 4-5 \end{Bmatrix} - 1-2-3 \begin{Bmatrix} 4-5 \\ 5-6 \end{Bmatrix} - 1-5-6 \begin{Bmatrix} 2-3 \end{Bmatrix} \Rightarrow 2 \times 6 = 12$$

$$P_5 = -8 + 12 = 4$$

$$P_6: \text{hexagon} : 1-2-3-4-5-6, 1-6-2-3-4-5, 1-2-6-5-4-3 : -2 \times 3 = 6$$

$$\text{loop} : 1-3-4-5 \& 2-6, 1-2-5-6 \& 3-4, 1-3-2-6 \& 4-5 : 2 \times 3 = 6$$

$$\text{triangle} : 0$$

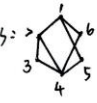
$$\text{loop} : 1-2 \& 3-4 \& 5-6, 1-3 \& 2-6 \& 4-5, 1-6 \& 2-3 \& 4-5, 1-5 \& 2-6 \& 3-4 : -1 \times 4 = -4$$

$$P_6 = -6 + 6 - 4 = -4$$

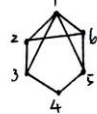
$$\Rightarrow C_p = X^6 - 9X^4 - 6X^3 + 11X^2 + 4X - 4$$

(2)

2. Find  $C_p(DM)$  of graph #20 and #25 in R4-15.

Ans:   $A = \begin{bmatrix} 0 & 1 & 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 1 \\ 1 & 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 \end{bmatrix} \Rightarrow DM = \begin{bmatrix} 1 & 6 & 1 & 1 & 5 & 5 \\ 6 & 1 & 5 & 7 & 1 & 1 \\ 1 & 5 & 1 & 6 & 1 & 1 \\ 1 & 7 & 6 & 1 & 6 & 6 \\ 5 & 1 & 1 & 6 & 1 & 1 \\ 5 & 1 & 1 & 6 & 1 & 1 \end{bmatrix}$

by matlab,  $C_p(DM) = x^6 - 6x^5 - 260x^4 - 214x^3 + 3811x^2 - 448x$

  $A = \begin{bmatrix} 0 & 1 & 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 & 1 \\ 1 & 1 & 0 & 1 & 0 & 0 \end{bmatrix} \Rightarrow DM = \begin{bmatrix} 1 & 7 & 2 & 1 & 7 & 7 \\ 7 & 1 & 6 & 1 & 1 & 6 \\ 7 & 6 & 1 & 5 & 1 & 1 \\ 1 & 1 & 5 & 1 & 5 & 1 \\ 7 & 1 & 1 & 5 & 1 & 6 \\ 7 & 6 & 1 & 1 & 6 & 1 \end{bmatrix}$

by matlab,  $C_p(DM) = x^6 - 6x^5 - 345x^4 - 1176x^3 + 9267x^2 + 19150x - 81800$

Ex: find  $CP(DM)$  by matlab:

```
syms x
DM = sym([1 6 1 1 5 5;
          6 1 5 7 1 1;
          1 5 1 6 1 1;
          1 7 6 1 6 6;
          5 1 1 6 1 1;
          5 1 1 6 1 1]);
charpoly(DM, x)
```

ans =

$$x^6 - 6x^5 - 260x^4 - 214x^3 + 3811x^2 - 448x$$

(3)

3. Find the graph of a KC with a code 4023

Ans:  $4023 = 2^{11} + 2^{10} + 2^9 + 2^8 + 2^7 + 2^5 + 2^4 + 2^2 + 2^1 + 2^0$

$\Rightarrow \underline{000111110110111} \Rightarrow \text{LTAM} = \begin{bmatrix} 0 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 & 1 & 0 & 0 \end{bmatrix}$

