VE203 Assignment 8

Liu Yihao 515370910207

Exercise 8.1

By the hint, we can guess that it is about the attack on the Pearl Harbour, and we can find 19 17 19 19, so they are probably "ATTA" in the word "attack" .If we make a deeper guess, the list from 19 in the first column and 8 in the fourth column is "ATTACK PEARL HARBOR". Then I find on the wiki that the attack happened on Dec 7th, and it just fit the other numbers. So the complete message is "ATTACK PEARL HARBOR DECEMBER SEVEN".

Exercise 8.2

$$c = m^e \bmod n = 23^7 \bmod 77 = 23(23 - 77 \times 7)^3 \bmod 77 = 23$$

Exercise 8.3

Suppose g^a, g^b are two elements in G

$$g^a \circ g^b = g^{a+b} = g^{b+a} = g^b \circ g^a$$

Exercise 8.4

$$3^a \equiv 6 \pmod 7$$
$$3^b \equiv 5 \pmod 7$$
$$a = 3,\ b = 5$$
$$5^3 \equiv 6^5 \equiv 6 \pmod 7$$

So their common secret key is 6

Exercise 8.5

i) vertices: 6
edges: 6
degrees: $a_1 = 2$, $a_2 = 4$, $a_3 = 1$, $a_4 = 3$, $a_5 = 2$, $a_6 = 0$

	a_1	a_2	a_3	a_4	a_5	a_6
a_1	0	1	0	1	0	0
a_2	1	0	1	1	1	0
a_3	0	1	0	0	0	0
a_4	1	1	0	0	1	0
a_5	0	1	0	1	0	0
a_6	0	0	0	0	0	0

ii) vertices: 6
edges: 12
degrees: $a_1 = 6$, $a_2 = 5$, $a_3 = 0$, $a_4 = 3$, $a_5 = 5$, $a_6 = 5$

	a_1	a_2	a_3	a_4	a_5	a_6
a_1	2	3	0	1	0	0
a_2	3	0	0	1	1	0
a_3	0	0	0	0	0	0
a_4	1	1	0	0	1	0
a_5	0	1	0	1	0	3
a_6	0	0	0	0	3	2

iii) vertices: 9
edges: 10
degrees: $a_1 = 2$, $a_2 = 2$, $a_3 = 2$, $a_4 = 0$, $a_5 = 2$, $a_6 = 3$, $a_7 = 2$, $a_8 = 4$, $s_9 = 5$

	a_1	a_2	a_3	a_4	a_5	a_6	a_7	a_8	a_9
a_1	0	0	0	0	0	1	0	0	1
a_2	0	0	0	0	0	0	1	0	1
a_3	0	0	0	0	0	1	0	1	0
a_4	0	0	0	0	0	0	0	0	0
a_5	0	0	0	0	0	0	0	0	0
a_6	1	0	1	0	0	0	1	0	0
a_7	0	1	0	0	0	1	0	0	0
a_8	0	0	1	0	0	0	0	0	3
a_9	1	1	0	0	0	0	0	3	0

Exercise 8.6

i)

$$V_1 = a, c, V_2 = b, d, e$$

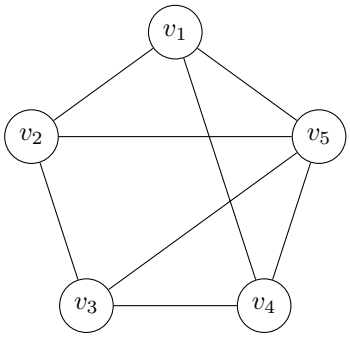
So it is bipartite.

ii) Since b, f, c forms a triangle, it is not bipartite.

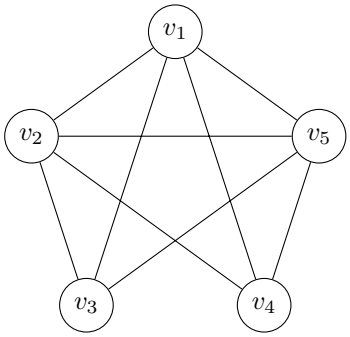
iii) Since b, e, f forms a triangle, it is not bipartite.

Exercise 8.7

i)



ii)



iii)