1. (15%) If, in a paged memory-management system, the frame size is 1024 and the following page map table applies to the currently executing process, compute the physical addresses that correspond to the following logical addresses:

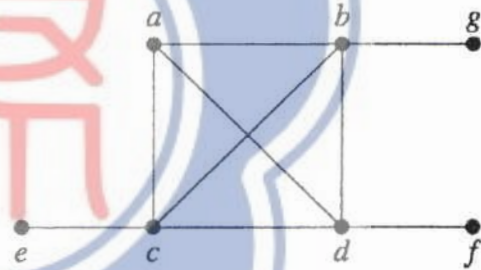   (i) <0, 85>
   (ii) <3, 1048>
   (iii) <2, 311>

2. (10%) How many edges does a graph have if its degree sequence is 5, 2, 2, 2, 2, 1? Please draw such a graph to explain.

3. (15%) In the following, determine whether the given graph has a Hamilton circuit. If it does, find such a circuit. If it does not, give an argument to show why no such circuit exists.
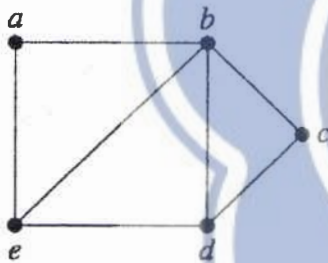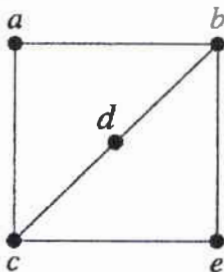
   (i)   (ii)

   (iii)

4. (10%) Please give the tight asymptotic bound for the following recurrence.

$$T(n) = 4T(n/2) + n^2$$

5. (20%) Suppose Host A wants to send a large file to Host B. The path from Host A to Host B has three links, of rates $R_1 = 500$ kbps, $R_2 = 2$ Mbps, and $R_3 = 1$ Mbps.

   (i) Assuming no other traffic in the network, what is the throughput for the file transfer?
   (ii) Suppose the file is 4 million bytes. Dividing the file size by the throughput, roughly how long will it take to transfer the file to Host B?

6. (20%)

   Given that $|A| = 55$, $|B| = 40$, $|C| = 80$, $|A \cap B| = 20$, $|A \cap B \cap C| = 17$, $|B \cap C| = 24$, and $|A \cup C| = 100$, find:

   (i) $|A \cap C|$
   (ii) $|C - B|$
   (iii) $|(B \cap C) - (A \cap B \cap C)|$.

   Draw a Venn diagram and mark on it the cardinalities of the sets corresponding to each region of the diagram.

   If $|\mathcal{U}| = 150$ find $|\overline{A \cup B \cup C}|$.

7. (10%)

   In each of the following, define the composite function $g \circ f$:

   $$f : \mathbb{R} \to \mathbb{R}, \quad f(x) = \begin{cases} x - 2 & \text{if } x \geqslant 1 \\ x^3 & \text{if } x < 1 \end{cases}$$

   $$g : \mathbb{R} \to \mathbb{R}, \quad g(x) = \begin{cases} (x + 4)/3 & \text{if } x \geqslant 0 \\ |x + 1| & \text{if } x < 0. \end{cases}$$

備　註　一、作答於試題上者，不予計分。
　　　　二、試題請隨卷繳交。