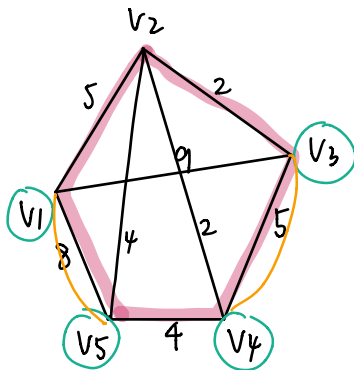


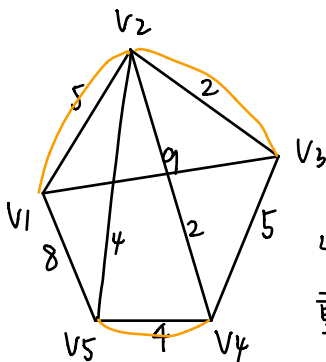
homework 6. 16(a) 17(a).

16. 找出图中所有度为奇数的点: v_1, v_3, v_4, v_5 .



添加边 $(v_1, v_5), (v_3, v_4)$, 使各结点度数均为偶数。

图示圈不满足重边长度之和不超过回路的一半, 取该回路共轭重边:

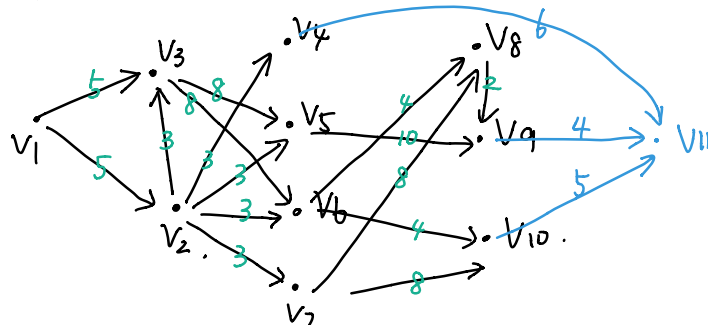


发现该图任一子回路中重边长度之和不超过回路的一半,

\therefore 图中一条欧拉回路如 $(v_1, v_2, v_3, v_4, v_5, v_2, v_4, v_5, v_1, v_3, v_2, v_1)$

17. (a) 由表可得, 若将工序2, 工序3交换编号, 则所有工序的前序工序编号均小于该工序编号。

\therefore 设工序 i 对应节点为 v_i , 建立PT图, 该图结点排序为拓扑序列。



图中 V_4, V_9, V_{10} 均为结束结点, 因此增设虚拟超结点 V_{11} 并建立 $w(V_9, V_{11})=4$
 $w(V_{10}, V_{11})=5, w(V_4, V_{11})=6$

转化为求 V_1 到 V_{11} 的关键路径

设 $\pi(V_i)$ 为 V_i 点开始时间. 初始令 $\pi(V_i)=0$ ($i=1, 2, \dots, 11$)

依次更新 $\pi(V_j)$, $j=2, 3, \dots, 11$

$$\pi(V_j) = \max_{\substack{V_i \text{ 为 } V_j \text{ 的} \\ \text{直接前驱}}} (\pi(V_i) + w(V_i, V_j)).$$

$$\text{则 } \pi(V_2) = 5$$

$$\pi(V_3) = \pi(V_2) + 3 = 8$$

$$\pi(V_4) = \pi(V_2) + 3 = 8$$

$$\pi(V_5) = \pi(V_3) + 8 = 16$$

$$\pi(V_6) = \pi(V_3) + 8 = 16$$

$$\pi(V_7) = \pi(V_2) + 3 = 8$$

$$\pi(V_8) = \pi(V_6) + 4 = 20$$

$$\pi(V_9) = \pi(V_5) + 10 = 26$$

$$\pi(V_{10}) = \pi(V_6) + 4 = 20$$

$$\pi(V_{11}) = \pi(V_9) + 4 = 30$$

\therefore 关键路径为 $(V_1, V_2, V_3, V_5, V_9, V_{11})$

下求各工序开始的最晚时间. 初始令 $T(V_i) = \pi(V_{11}) = 30$, $i=1, 2, \dots, 11$

依次更新 $T(V_j)$, $j=10, 9, \dots, 1$

$$T(V_j) = \min_{\substack{V_i \text{ 为 } V_j \text{ 的} \\ \text{直接后继}}} (T(V_i) - w(V_j, V_i))$$

$$T(V_{10}) = T(V_{11}) - 5 = 25$$

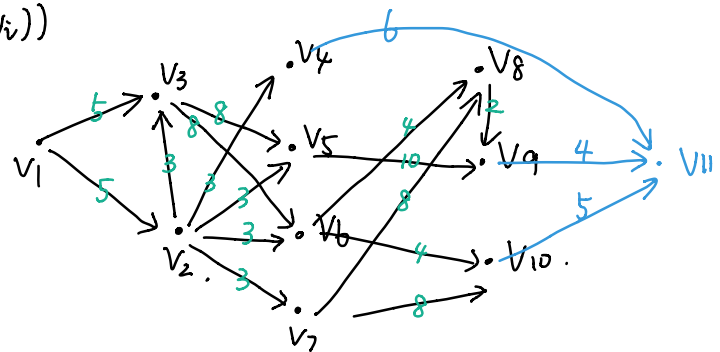
$$T(V_9) = T(V_{11}) - 4 = 26$$

$$T(V_8) = T(V_9) - 2 = 24$$

$$T(V_7) = T(V_{10}) - 8 = 17$$

$$T(V_6) = T(V_8) - 4 = 20$$

$$T(V_5) = T(V_9) - 10 = 16$$



$$T(V_4) = T(V_{11}) - 6 = 24$$

$$T(V_3) = T(V_5) - 8 = 8$$

$$T(V_2) = T(V_3) - 3 = 5$$

$$T(V_1) = T(V_2) - 5 = 0$$

∴ 工序3 (即重编号后的工序2) 允许延误时间 $t(V'_3) = T(V_2) - \pi(V_2) = 0$

$$\text{工序5: } t(V'_5) = T(V_5) - \pi(V_5) = 0$$

$$\text{工序10: } t(V'_{10}) = 25 - 20 = 5$$