Student Name: Tevin Achong
Student ID: 816000026
Student Name: Raeanne Ramharrack
Student ID: 816008940
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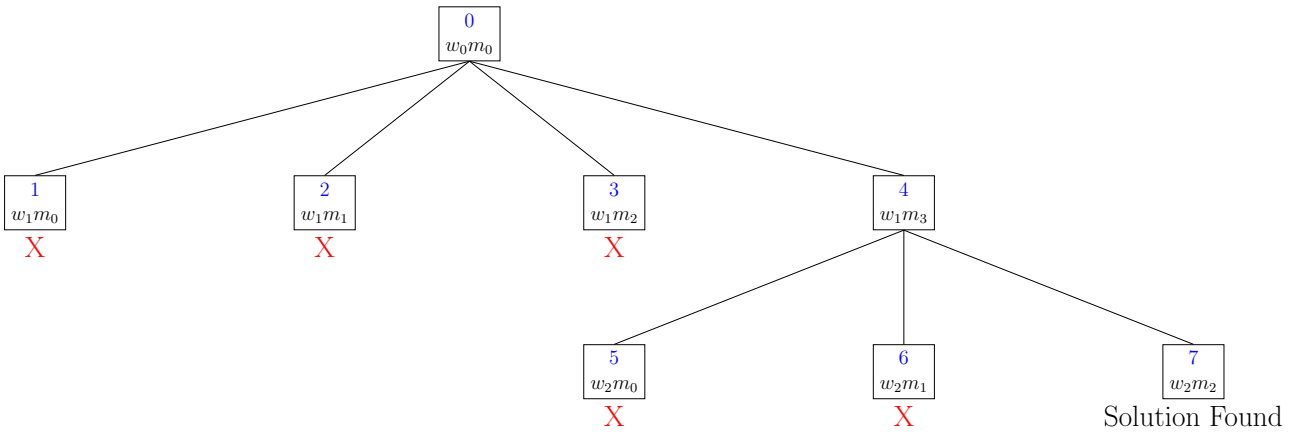
Question 1

For this question, we let w_i indicate the ith woman, and m_i indicate the ith man. The notation $w_i m_i$ indicates that the ith woman marries the ith man. For example, $w_2 m_3$ would indicate that the 2nd woman marries the 3rd man. The following search tree is derived for the Hall's Marriage Problem with:

w_0 having preferences m_0, m_1, m_2
w_1 having preferences m_0, m_3, m_5
w_2 having preferences m_2, m_5



Explanation:

1. Node 0: We try $w_0 m_0$. Since m_0 is in the set of preferences of w_0 and no w has yet married m_0 we continue down this path.

2. Node 1: We try $w_1 m_0$. This cannot work because even though m_0 is in the set of preferences of w_1, w_0 has already married m_0, so we abort this path.

3. Node 2: We try $w_1 m_1$. This cannot work since m_1 is not in the set of preferences of w_1, so we abort this path.

4. Node 3: We try $w_1 m_2$. This cannot work since m_2 is not in the set of preferences of w_1, so we abort this path.

5. Node 4: We try $w_1 m_3$. Since m_3 is in the set of preferences of w_1 and no w has yet married m_3 we continue down this path.

6. Node 5: We try $w_2 m_0$. This cannot work since m_0 is not in the set of preferences of w_2, and w_0 has already married m_0, so we abort this path.

7. Node 6: We try $w_2 m_1$. This cannot work since m_1 is not in the set of preferences of w_2, so we abort this path.

8. Node 7: We try $w_2 m_2$. Since m_2 is in the set of preferences of w_2 and no w has yet married m_2 we accept this pair. And since all women have been paired with a man, this is our solution.

Solution: $w_0 m_0$, $w_1 m_3$, $w_2 m_2$.