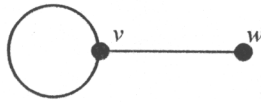


- (20%) Derive the minimum state diagram of a Moore-style clocked sequential circuit that recognizes the input sequence 1010 that may overlay.
- (18%) For the following undirected graph, find and solve the recurrent relation for the number of closed v - v walks of length n , $n \geq 1$.



- (12%) If G is a group of even order, prove that there is an element $a \in G$ with $a \neq e$ and $a \neq e^{-1}$
- (16%) Let $S = \{s_1, s_2, \dots, s_n\}$ be a set of symbols that are used in communication and f_i be the frequency that s_i is used such that

$$f_k = f_{k-1} + f_{k-2}, \quad k \geq 3$$

$$f_1 = f_2 = 1$$
 What is the Huffman codes for S ?
- (17%) If $T(n) = T(0.5n) + T(0.3n) + cn$, where c is a constant, then $T(n) = ?$
Prove it.
- (17%) Let X be a positive integer such that the remainder of X divided by 2 is 1,
the remainder of X divided by 3 is 1,
the remainder of X divided by 5 is 2.
What is the least possible value of X . Note that you must show the process you get the number, otherwise you get no credit.