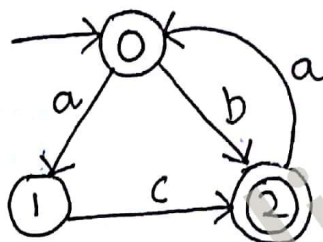


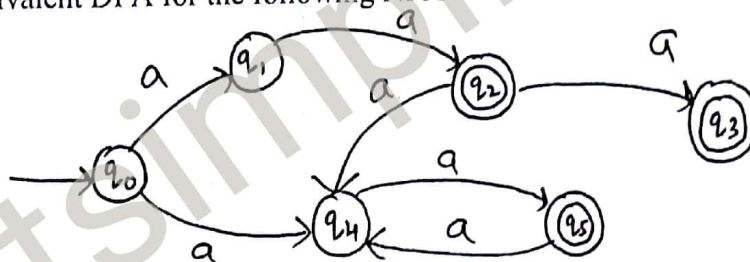
Answer all Questions

Q.1. Design a DFA to accept the language $L = \{x \mid x \text{ starts and ends with the } \textit{game} \text{ symbol}\}$ over input alphabet $\Sigma = \{a, b, c\}$. Clearly indicate the initial and final states. (3)

Q.2. Give a regular expression for the following FA (2)



Q.3. Draw an equivalent DFA for the following NFA (3)



Q.4. Write the grammar for the language of set of all strings over the input alphabet $\{a, b\}$ that ends with 'a' and do not contain the substring 'bb'. (3)

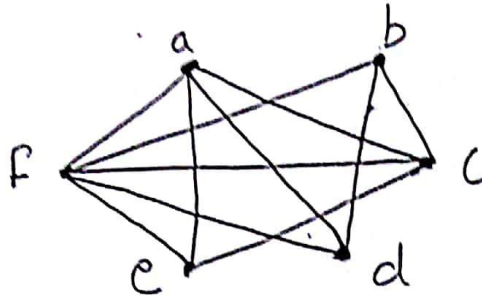
Q.5. Construct a regular expression over the input alphabet $\{a, b\}$ that accept all strings where: (2)

- Each string contains atmost 3 a's. (2)
- The length of the string is divisible by 3. (2)

Q.6. Suppose we want to schedule some final exams for CS courses with the following course numbers: 1007, 3137, 3157, 3203, 3261, 4115, 4118 and 4156. Suppose also that there are no students in common taking the following pairs of courses: 1007-3137, 1007-3157, 1007-3203, 1007-3261, 1007-4115, 1007-4118, 1007-4156, 3137-3157, 3137-3261, 3137-4115, 3137-4118, 3137-4156, 3157-4156, 3203-4115, 3203-3261 and 3261-4115. How many minimum exam slots are necessary to schedule the exams? (3)

- ✓ Q.7. Consider an undirected graph where vertex having number 2 to 12 (including 2 and 12) there is an edge between two vertex x and y iff x divides y . Find the number of connected components. (2)

- ✓ Q.8. Solve the following questions:
- For which values of n do the K_n (complete graph) have an Euler circuit. (1.5)
 - Determine whether the following graph is planar or not. (1.5)



- ✓ Q.9. Show that if n is integer and n^3+5 is odd, then n is even using
- a proof by contraposition (1.5)
 - a proof by contradiction (1.5)
- ✓ Q.10. Determine whether the relation R on the set of all web pages is reflexive, symmetric, anti-symmetric and/or transitive, where $(a, b) \in R$ if and only if
- Everyone who has visited web page 'a' has also visited web page 'b'. (2)
 - There are no common links found on both webpage 'a' and web page 'b'. (2)

- ✓ Q.11. Let G be the set of all non-zero real numbers and let

$$a * b = ab/2$$

Show that $(G, *)$ is an abelian group. (3)

- ✓ Q.12. Determine whether each of these functions is bijection from \mathbb{R} to \mathbb{R} . (2)
- $f(x) = -3x + 4$
 - $f(x) = -3x^2 + 7$