Bachelor Level/ First Year/ Second Semester/ Science   Full Marks:80
Computer Science and Information Technology (CSC 152)   PassMarks:32
(Discrete Structure)   Time: 3hours

Candidates are required to give their answers in their own words as for as practicable.
The figures in the margin indicate full marks.

Attempt all questions:

Group A (10x2=20)

1. Define disjunction and conjunction with suitable examples.
2. Is the following argument valid?
Smoking is healthy. If smoking is healthy, then cigarettes are prescribed by physicians.

∴Cigarettes are prescribed by physicians

3. State the rules for the strong form of mathematical induction with propositions.
4. State and prove "the extended pigeonhole principle".
5. Define the terms a language over a vocabulary and the phrase – structure grammar.
6. Distinguish between binary tree and spanning tree with suitable examples.
7. Consider Kn, the complete graph on n vertices. What is the degree of each vertex?
8. Explain the static transition function of the finite state machine with a suitable table.
9. Define regular expression over a non-empty set A.
10. What is the chromatic number of the complete bipartite graph, where m and n are positive integers?

Group B (5x4=20)

11. Explain the rules of inference for quantified statements.
12. Let A = {p, q, r}. Give the regular set corresponding to the regular expression given:
a) (p ∨ q) ⌐ q* b) p(q q)* r.
13. Find an explicit formula for the Fibonacci sequence defined by

$f_n = f_{n-1} + f_{n-2}$, $f_1 = f_2 = 1$

14. Define finite – state machines with output.
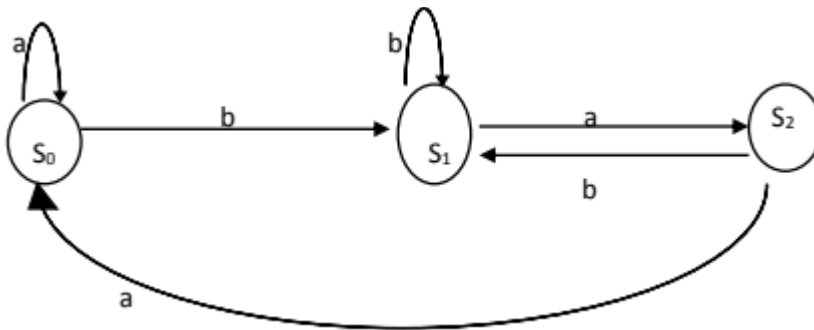
15. Show that the maximum number of vertices in a binary tree of height n is

$2n+1 - 1$.

OR

Draw all possible unordered trees on the set {a, b, c}.

Group C (5x8=40)

16. Construct the transition table of the finite – state machine whose diagraph is shown?

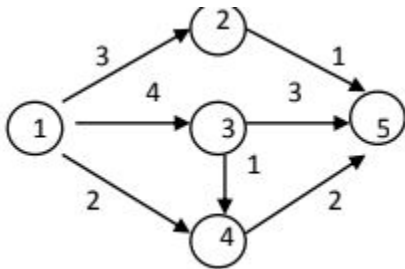17. Let G = (V, S, v0, |→), where V = { v0, x, y, z}, S = {x, y, z } and

        |→ : v0 |→ xv0

        |v0 |→ yv0

        |v0 |→ z

        What is L(G), the language of this grammar?

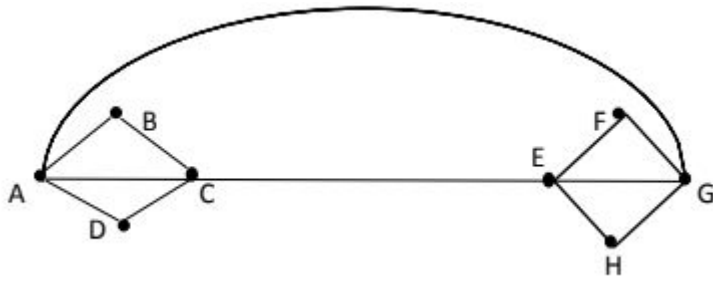18. Find a maximum flow in the network shown in figure

19. Prove that a symmetric connected relation has a undirected spanning tree.

OR

Give a simple condition on the weights of a graph that will guarantee that there is a unique maximal spanning tree for the graph.

20. Use Fleury's algorithm to construct an Euler circuit for the following graph.

OR

Explain the concept of network flows and max-flow min- cut with suitable examples.

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