Tribhuvan University
Institute of Science and Technology
2068

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Bachelor Level/ First Year/ Second Semester/ Science   Full Marks: 80
Computer Science and Information Technology (CSC 152)   Pass Marks: 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:

<u>**Group A**</u>   (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 K_n, 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?

<u>**Group B**</u>   (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 v q) ⌐ q*   b) p(q q)* r.
13. Find an explicit formula for the Fibonacci sequence defined by

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

14. Define finite – state machines with output.
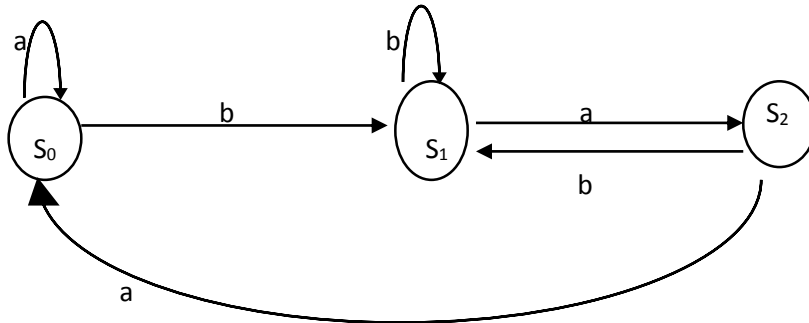15. Show that the maximum number of vertices in a binary tree of height n is $2^{n+1} - 1$.

OR

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

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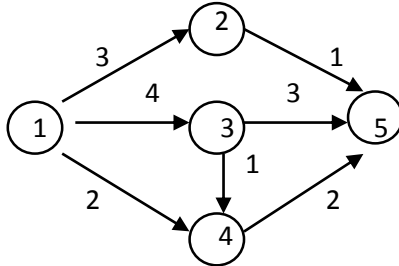
16. Construct the transition table of the finite – state machine whose diagraph is shown?

17. Let G = (V, S, v_0, |→),   where V = { v_0, x, y, z}, S = {x, y, z } and

    |→ : v_0 |→ xv_0

    v_0 |→ yv_0

    v_0 |→ z

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

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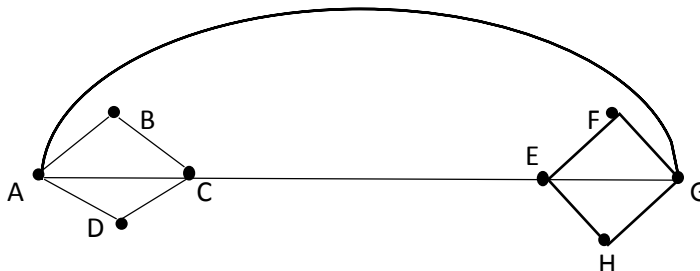

19. Prove that a symmetric connected relation has a undirected spanning tree.

                                        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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