

Tribhuvan University
Institute of Science and Technology
2068

Bachelor Level / Second Semester / Science

Computer Science and Information Technology(CSC160)

((TU CSIT) Discrete Structures)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Full marks: 80

Pass marks: 32

Time: 3 hours

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 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?

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) $(p \vee q) \sqcap q^*$ b) $p(qq)^*r$.

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.

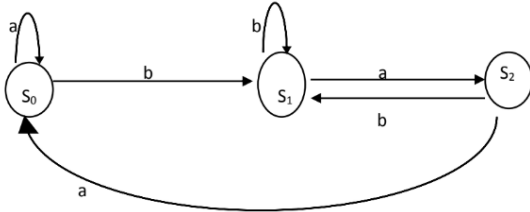
15. Show that the maximum number of vertices in a binary tree of height n is $2^{n+1} - 1$.

OR

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

Group C (5x8=40)

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



17. Let $G = (V, S, v_0, \mapsto)$, where $V = \{v_0, x, y, z\}$, $S = \{x, y, z\}$ and

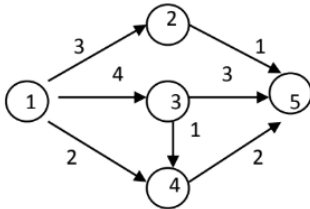
$\mapsto : v_0 \mapsto xv_0$

$v_0 \mapsto yv_0$

$v_0 \mapsto z$

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

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

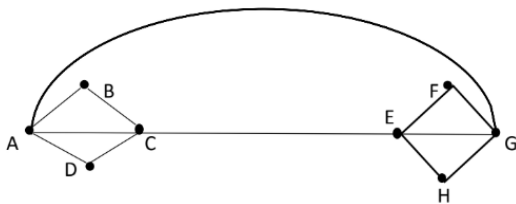


19. Prove that a symmetric connected relation has a undirected spanning tree.

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.