CSc-152-2074 ✡

Tribhuvan University
Institute of Science and Technology
2074

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Bachelor Level / First Year/ Second Semester/ Science
Computer Science and Information Technology (CSc.152)
(Discrete Structure)

Full Marks: 80
Pass Marks: 32
Time: 3 hours.

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 the term converse, contropositive and inverse.

2. Is the following argument valid? If Socrates is human, then Socrates is mortal Socrates is human.
   ∴ Socrates is mortal.

3. State the rule 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 regular grammer and regular expression.

6. Define linear homogeneous recurrence relation.

7. Explain the state transition function of the finite state machine with a suitable table.

8. Distinguish between multigraph and pseudograph with suitable examples.

9. Define regular expression over a non empty set A.

10. What is regular graph?

Group B (5x4=20)

11. Express the statement "Evengone has exactly one best friend" as a logical expression involving predicates, quantifiers with a domain consisting of all people and logical connectives.

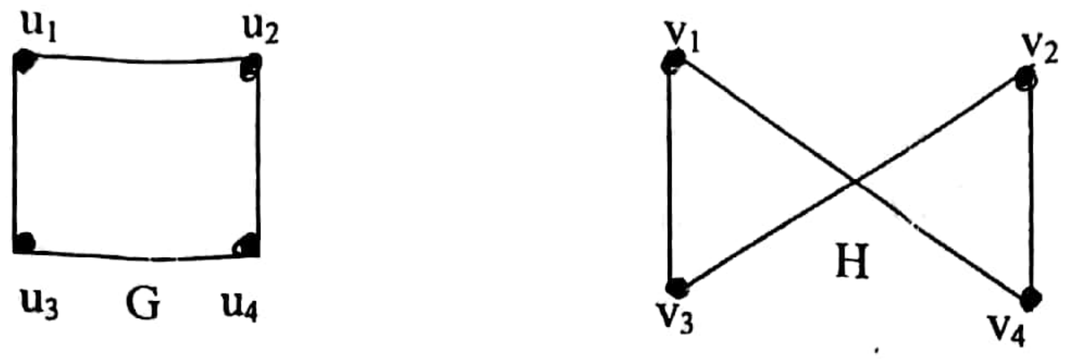
12. Let A = {p, q, r}. Give the regular set corresponding to the regular expression give:
    (a) (pvq)rq* (b) p (q q)*r.

13. Explain the finite-state with output with suitable examples.

OR

Explain the deterministic finite state automata. When are two finite state outomata equivalent? Give an example.

14. When does the two simple graphs $G_1 = m (V_1, E_1)$ and $G_2 (V_2, E_2)$ are isomorphic. Show that the graph G = (V, E) and H = (W, F) displayed in the following figure are isomorphic.



15. Define rooted tree. Show that a full m-ary tree with i internal vertices contains n = mi + 1 vertices.

Group C

(5x8=40)

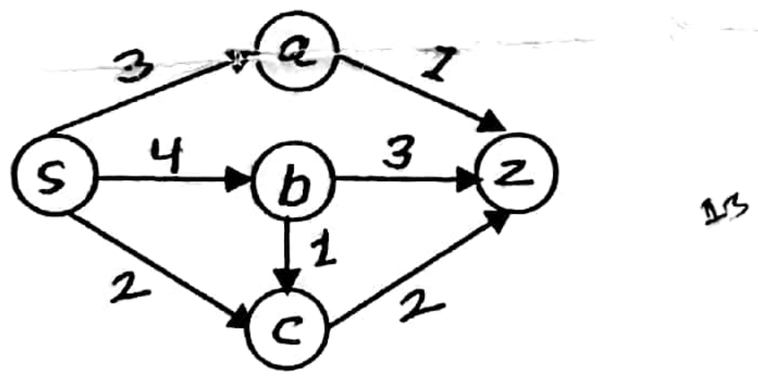
16. Construct truth tables to determine whether the given sttement is a tautology a contingency or an absurdity.
    (a) $p \Rightarrow (q \Rightarrow p)$
    (b) $q \Rightarrow (q \Rightarrow p)$
    (c) $p \wedge \sim p$

OR

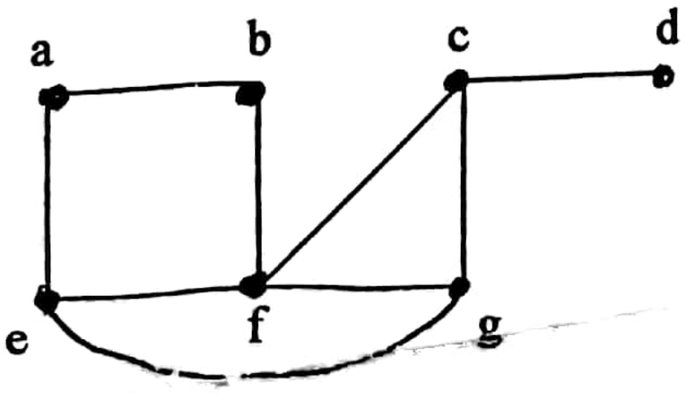
Explain the method of proving theorems by direct indirect, controdiction and by cases.

17. Define linear homogeneous recurssion relation of degree k with constant coefficient with suitable examples. What is the solution of recurrence relation $a_n = 6\ a_{n-1} - 9\ a_{n-2}$ with $a_0 = 1$ and $a_1 = 6$?

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



19. What do you mean by spanning tree? Find a spanning tree of the simple graph G as shown in figure.



A simple graph is connected if and only if it has a spanning tree.

OR

Prove that an undirected graph is a tree if and only if there is a unique simple path between any two of its vertices.

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