

Tribhuvan University
Institute of Science and Technology
2080
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Bachelor Level / First Year/ Second Semester/ Science
Computer Science and Information Technology (CSC165)
(Discrete Structure)
(NEW COURSE)

Full Marks: 60
Pass Marks: 24
Time: 3 hours.

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

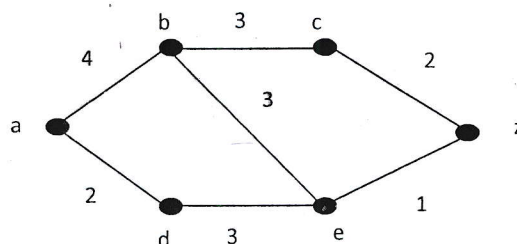
Section A

Long answer questions.

Attempt any TWO questions.

(2×10=20)

- How can you use mathematical induction to prove statements? Use mathematical induction to show that the sum of first n positive integers is $\frac{n(n+1)}{2}$. (4 + 6)
- Explain linear homogeneous recurrence relation with constant coefficients. What is the solution of the recurrence relation $a_n = 6a_{n-1} - 9a_{n-2}$ with initial conditions $a_0 = 1$ and $a_1 = 6$? (2 + 8)
- What is shortest path problem? Use Dijkstra's shortest path algorithm to find the shortest path between the vertices a and z in the weighted graph given below. (2 + 8)



Section B

Short answer questions.

Attempt any EIGHT questions.

(8×5=40)

- Let us assume that R be a relation on the set of ordered pairs of positive integers such that $((a,b), (c,d)) \in R$ if and only if $ad=bc$. Is R an equivalence relation? (5)
- Define function. Let f_1 and f_2 be functions from R to R such that $f_1(x) = x^2$ and $f_2(x) = x - x^2$. What are the functions $f_1 + f_2$ and $f_1 f_2$? (2 + 3)
- Explain fuzzy set with example. How do you find complement of a fuzzy set? (2.5 + 2.5)
- What is congruent modulo? Determine whether 37 is congruent to 3 modulo 7 and whether -29 is congruent to 5 modulo 17. (2 + 1.5 + 1.5)
- Define network flow with example. What are saturated edge, unsaturated edge and slack value? (2+3)
- Give an example of tautology and contradiction. Show that implication and contrapositive are equivalence. (2+3)
- What is direct proof? Give a direct proof that if m and n are both perfect squares, then mn is also a perfect square. (1.5 + 3.5)
- What is product rule? How many strings are there of four lowercase letters that have the letter x in them? (1.5 + 3.5)
- Explain matrix representation of relations with example. (5)