**Tribhuwan University**
**Institute of Science and Technology**
**2078**

Bachelor Level / Second Semester / Science — Full marks: 60
**Computer Science and Information Technology(Na)** — Pass marks: 24
((TU BIT) Discrete Structure) — 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.

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**Section A**

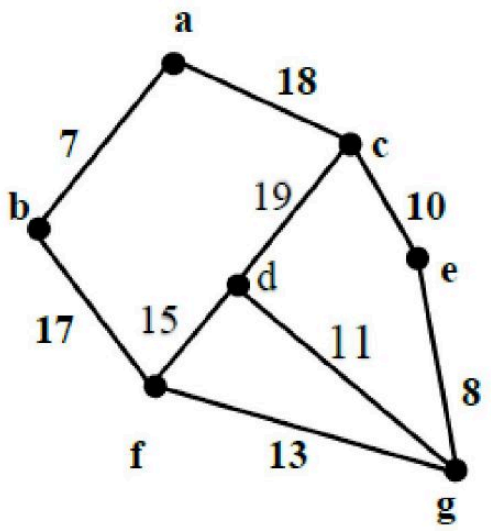
**Long Answer Questions**

**Attempt any two questions. (2 x 10 = 20)**

**1. Explain direct proof, indirect proof, and proof by contradiction. Use direct proof to show that "If n is an odd integer, then $n^2$ is an odd integer". Also, use indirect proof to show that "If n is an integer and $n^2$ is odd then n is odd". (6+2+2)**

**2. What is linear nonhomogeneous recurrence relation of degree k with constant coefficients? Find all the solutions of the recurrence relation $a_n = 4a_{n-1} + n^2$. Also find the solution of the relation with initial condition $a_1 = 1$. (2+6+2)**

**3. Define spanning tree and minimum spanning tree with suitable example. Use Kruskal's algorithms to find minimum spanning tree in the given graph. (4+6)**




**Section B**

**Short Answer Questions**

**Attempt any eight questions. (8×5=40)**

**4. What is tautology? Show $(p \wedge q) \rightarrow (p \vee q)$ is a tautology.**

**5. Define cartesian product. Find $A^3$ for the set A= {a, b, c}. (1+4)**

**6 How can you represent relations using matrices? Suppose that A= {1, 2, 3} and B= {1, 2}. Let R be the relation from A to B containing (a, b) if $a \in A$, $b \in B$, and a > b. What is the matrix representing R if $a_1 = 1$, $a_2 = 2$, and $a_3 = 3$, and $b_1 = 1$ and $b_2 = 2$? (2.5+2.5)**

**7. Use mathematical induction to show that the sum of first n positive integers is $\frac{n(n+1)}{2}$.**

**8. What is congruent modulo? Determine whether 20 is congruent to 8 modulo 6 and 25 is congruent to 17 modulo 5. (3+2)**

**9. Explain trial division with example? Using trial division, show that 101 is prime. (2+3)**

**10. Explain product rule. How many strings are there of four lowercase letters that have the letter x in them? (2+3)**

**11. What is graph? Explain simple graph and pseudograph with example. (1+2+2)**

**12. What is Euler path? Compare it with Hamilton path. (2+3)**