Tribhuvan University
Institute of Science and Technology
2080

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Bachelor Level / First Year/ Second Semester/ Science   Full Marks: 60
Computer Science and Information Technology (CSC160)   Pass Marks: 24
(Discrete Structure)   Time: 3 hours.
(OLD COURSE)

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

Section A

Long answer questions.
Attempt any TWO questions.   **(2×10=20)**

1. Explain proof by contraposition and proof by contradiction. Show that if n is an integer and $n^3 + 5$ is odd, then n is even using a) a proof by contraposition, b) a proof by contradiction.
          (4 + 3 + 3)

2. Define recurrence relation. Compare linear homogeneous recurrence relation with linear nonhomogeneous recurrence relation. What is the solution of the recurrence relation $a_n = -4a_{n-1} - 4a_{n-2}$ for $n \geq 2$, $a_0 = 0$, $a_1 = 1$?   (2 + 2 + 6)

3. Explain graph as models of flow of Commodities. How do you find maximal flow in the transport network? State max-flow min-cut theorem.   (2 + 6 + 2)

Section B

Short answer questions.
Attempt any EIGHT questions.   **(8×5=40)**

4. How can you represent sets using bit strings? Let U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}. What bit strings represent the subset of all odd integers in U, the subset of all even integers in U, and the subset of integers not exceeding 5 in U?   (2 + 3)

5. Define floor and ceiling function. What do you mean by exponential function?   (3 + 2)

6. Define summation. What is the value of the double sum $\sum_{i=1}^{2}\sum_{j=1}^{3}(i + j)$? (1 + 4)

7. Explain Euclidean algorithm. Use this algorithm to find gcd(111, 201).   (2 + 3)

8. Find the Boolean product of A = $\begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 0 \end{bmatrix}$ and B = $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$.   (5)

9. Define predicate. Compare existential quantifier with universal quantifier. (1 + 4)

10. What is structural induction? Explain.   (5)

11. What is the probability that a positive integer selected at random from the set of positive integers not exceeding 100 is divisible by either 2 or 5?   (5)

12. Explain Hamilton path and circuit with suitable example.   (2.5 + 2.5)