FACULTY OF INFORMATICS
B.E. 2/4 (IT) I Semester (Suppl.) Examination, June 2012
DISCRETE MATHEMATICS

Time: 3 Hours]   [Max. Marks : 75

**Note** : 1) Answer **all** questions of Part **A**.
          2) Answer **any five** questions of Part **B**.

PART – A   (25 Marks)

1. Define EXCLUSIVE OR with an example.   2

2. State the converse, contra positive and inverse of each of following conditional statements.

   a) If it snows tonight, then I will stay at home.

   b) I go to the beach whenever it is a sunny summer day.   2

3. Define contradiction with an example.   2

4. State De Morgan laws; write truth table for any one law.   3

5. Explain predicate and predicate calculus.   3

6. Determine the truth value of each of these statements if the domain consists of all integers.

   a) $\forall n\,(n+1>n)$

   b) $\exists n(2n=3n)$.   2

7. Use predicates, quantifiers, logical connectives and mathematical operators to express the statement that every positive integer is the sum of the squares of four integers.   3

8. Define Big-O Notation.   3

9. Determine whether the posets $(\{1, 2, 3, 4, 5\}, |\,)$ and $(\{1, 2, 4, 8, 16\}, |\,)$ are lattices.   3

10. Define wheel graph and give one example.   2
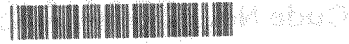
PART – B   (50 Marks)

11. Construct a truth table for each of these compound propositions.   (5×2=10)

    a) $(p \lor q) \rightarrow (p \oplus q)$

    b) $(p \oplus q) \rightarrow (p \land q)$

    c) $(p \lor q) \oplus (p \land q)$

    d) $(p \leftrightarrow q) \oplus (\neg p \leftrightarrow q)$

    e) $(p \leftrightarrow q) \oplus (\neg p \leftrightarrow \neg r)$

12. a) Show that $p \rightarrow q$ and $\neg p \lor q$ are logically equivalent.   (4+6)

    b) Use truth tables to verify the absorption laws.

      i) $p \lor (p \land q) \cong p$

      ii) $p \land (p \lor q) \cong p$

13. a) Prove or disprove that $[x + y] = [x] + [y]$ for all real numbers x and y.

    b) Explain the relationship between logical equivalences and set identities.   (5+5)

14. a) Prove that 5 divides $n^5 - n$ whenever n is a nonnegative integer.

    b) Find the number of positive integers between 1000 and 9999 inclusive are divisible by 5 but not by 7 ?   (5+5)
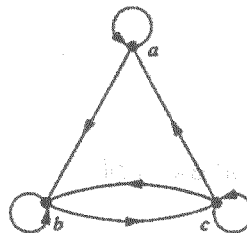
15. a) Solve $a_n = na_{n-1}$, $a_0 = 5$.

    b) Find the coefficient of x^9 in $(x^2 + x^3 + x^4 + x^5 + x^6 + \ldots)^3$.   (4+6)

16. a) Draw the Hasse diagram representing the partial ordering $\{(a, b) \mid a$ divides $b\}$ on $\{1, 2, 3, 4, 6, 8, 12\}$.

    b) Determine whether the relations for the following directed graph is reflexive, symmetric, anti symmetric and/or transitive.   (4+6)

17. a) How many different spanning trees does each of these simple graphs have ?

    i) K_3

    ii) K_4

    iii) $K_{2,2}$

    iv) C_s

  b) Find a spanning tree for the following graph using breadth-first.   (4+6)

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