FACULTY OF INFORMATICS

B.E. 2/4 (IT) I-Semester (Main) Examination, November / December 2012

Subject : **Discrete Mathematics**

Time : 3 Hours   **Max. Marks: 75**

Note: Answer all questions of Part - A and answer any five questions from Part-B.

PART – A (25 Marks)

1. What are the contrapositive, the converse, the inverse of the conditional statement "The

   home team wins whenever it is raining"? (2)

2. Define an IMPLICATION with an example. (2)

3. Define TAUTOLOGY with an example. (2)

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

5. Write universe of discourse property. (3)

6. What are the negations of the statements $\forall x(x^2 > x)$ and $\exists x(x^2 = 2)$? (2)

7. Use predicates, quantifiers, logical connectives and mathematical operators to express the

   statement that there is a positive integer that is not the sum of three squares. (3)

8. Show that n^2 is not $O(n)$. (3)

9. Define totally ordered set. (3)

10. Define Complete Graphs and give an example. (2)

PART – B (5x10=50 Marks)

11. Construct a truth table for each of these compound propositions. (5x2=10)

   (a) $p \oplus p$ (b) $p \oplus \neg p$ (c) $p \oplus \neg q$ (d) $\neg p \oplus \neg q$ (e) $(p \oplus q) \vee (p \oplus \neg q)$

12. (a) Show that $\neg(p \vee q)$ and $\neg p \wedge \neg q$ are logically equivalent. (4)

   (b) Use truth tables to verify the associative laws

      (i) $(p \vee q) \vee r = p \vee (q \vee r)$ (ii) $(p \wedge q) \wedge r = p(q \wedge r)$ (6)

13. (a) For which real numbers x and y is it true that $[x + y] = [x] + [y]$? (5)

   (b) Show that $f(x) = x^2 + 2x + 1$ is $O(x^2)$. (5)

14. (a) Prove that 3 divides $n^3 + 2n$ whenever n is a positive integer. (5)

   (b) Find the number of positive integers between 1000 and 9999 inclusive are not

      divisible by either 5 or 7? (5)

15. (a) Solve $a_n = a_{n-1} + 2_n + 3$, $a_0 = 4$. (5)

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

16.(a) Let R be the relation on the set of people such that x R y if x and y are people and x is older than y. Show that R is not a partial ordering. (5)

  (b) Determine whether the relations for the following directed graph is reflexive, symmetric, anti symmetric and / or transitive. (5)
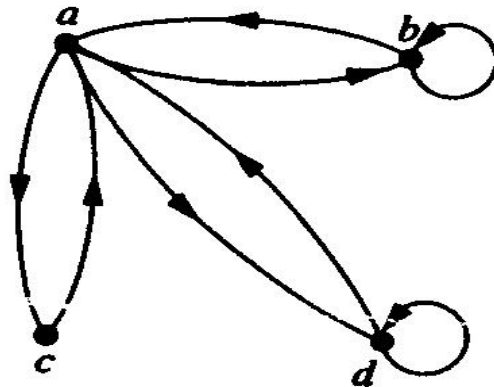
17.(a) Find the degree sequence of each of the following graphs: (4+6)

  (i) K_4 (ii) C_4 (iii) W_4 (iv) $K_{2,3}$

  (b) Find a spanning tree of the following simple graph.

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