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B.Tech. First Assessment Examinations – August 2017
Third Semester
Computer Science and Engineering
# 15MAT201 Discrete Mathematics

[Time: Two Hours                                                    Maximum: 50 Marks]

**Answer all the questions**

**PART – A**                                                              **(7 × 2 = 14)**

1. Negate and simplify the following: (i). $\exists x [ p(x) \vee q(x)]$,  (ii). $\forall x [ p(x) \wedge q(x)]$.

2. Write the inverse and converse of the statement "An automated e-mail reply can be sent when you are travelling"

3. Give a recursive algorithm for finding the sum of the first $n$ odd positive integers.

4. Find the truth values of the statements if the universe of discourse consists of all integers  (i). $\forall n (n+1 > n)$          (ii). $\forall n (n^2 > n)$.

5. Explain how the pigeonhole principle can be used to show that among any positive 91 integers, there are at least 10 that end with same digit.

6. How many bit strings of length 10 have

    (i).  exactly two  0s?     (ii). the same number of 0s and 1s?

7.  Is that $nCr = nCn\text{-}r$ ? Justify your answer.

**PART – B**                                                              **(6 × 6 = 36)**

8.  Verify the primitive statements $[(p \vee q ) \rightarrow r ]$ and $[\neg r \rightarrow \neg(p \vee q)]$ are logically equivalent using (i). with truth table    (ii). without truth table.

9. Show that the following argument is valid.

   (i). If the band could not play music or the refreshments were not delivered on time, then New Year's party would have been canceled and Ram would have been angry.

   (ii).  If the party were canceled, then refunds would have had to be made.

   (iii). No refunds were made.

   (iv). Therefore the conclusion is the band could play music.

10.  The  English  alphabet  contains  21  consonants  and  five  vowels.  How  many strings  of six lowercase letters of the English alphabet contain (without repetition)

             (i).  exactly 1 vowel ?
             (ii).  exactly  2 vowels?
            (iii). At least one vowel?

11. Use mathematical induction to prove that 9 divides $n^3 + (n + 1)^3 + (n + 2)^3$, whenever $n$ is a nonnegative integer.

12. Show that $[(p \lor q) \land (\neg p \lor r)] \to (q \lor r)$ is a tautology.

13. Show that if $n$ is an integer and $n^3 + 5$ is odd the n is even by using

   (i) method of contra positive

   (ii) method of contradiction.

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