

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)**

CLASS: MCA  
BRANCH: MCA

SEMESTER : FIRST  
SESSION : MO/2013

TIME: 3 HOURS

SUBJECT: MCA 1007 DISCRETE MATHEMATICS

FULL MARKS : 60

**INSTRUCTIONS:**

1. The question paper contains 7 questions each of 12 marks and total 84 marks.
  2. Candidates may attempt any 5 questions maximum of 60 marks.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
- 

- Q.1(a) Define a set. Describe all operations on sets with examples. [6]  
(b) State and prove De Morgan's law on sets. [6]
- Q.2(a) By using truth table, show that the statements  $p \vee (q \wedge r)$  and  $(p \vee q) \wedge (p \vee r)$  are equivalent. [8]  
(b) Use mathematical induction to prove the inequality  $n < 2^n$  for all positive integer n. [4]
- Q.3(a) State and Prove Pigeonhole Principle. [6]  
(b) How many poker hands of 5 cards can be dealt from a standard deck of 52 cards? Also how many ways are there to select 47 cards from a standard deck of 52 cards? [6]
- Q.4(a) Describe Equivalence relation with an example. [6]  
(b) Describe path of a Diagraph with a suitable example. [6]
- Q.5(a) Define one-one and onto functions. Determine the function defined by  $f(n) = n^2 + 1$  from Z to Z is one to one. [8]  
(b) Show that if both f and g are onto functions, then fog is also onto. [4]
- Q.6 Define a tree with all its properties. Show that a tree is a relation which has no reflexive, no symmetric and no transitive property. [12]
- Q.7 Define Semi Group, Monoid and Group under the addition and multiplication binary relation on a set. Give suitable examples satisfying all the above group properties. [12]