

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE-27
 MID SEMESTER TEST- AUGUST 2016
 M.Sc. MATHEMATICS-I SEMESTER
 MT 7514 - DISCRETE MATHEMATICS

Time : 1 ½ hrs.

Max. Marks: 35

The question paper has two printed pages.

ANSWER ANY SEVEN OF THE FOLLOWING.

7x5 = 35

1. Using rules of inference show that the hypotheses "If you send me an e-mail message then I will finish writing the program", "If you do not send me an e-mail message then I will go to sleep early", and "If I go to sleep early then I will wake up feeling refreshed" lead to the conclusion "If I do not finish writing the program then I will wake up feeling refreshed."
2. Express the following premises and conclusion using quantified statements.
 Premises: "A student in this class has not read the book" and "everyone in this class passed the first exam"
 Conclusion: "Someone who passed the first exam has not read the book."
3. a) How many ways are there to form a three letter sequence using the letters a, b, c, d, e, f
 - i. Without repetition of any letter.
 - ii. Without repetition and containing the letter e . 3
 b) How many licence plates can be made using two letters followed by four digits which have only vowels and even digit (repetition of digits and letters are allowed)? 2
4. a) There are 5 different English books, 6 different Hindi books and 8 different Kannada books
 - i. How many ways are there to select one book?
 - ii. How many ways are there to select 3 books one of each language.
 - iii. How many ways are there are there to select a pair of books not both in same language. 3
 b) What is the minimum number of students required in a class to be sure that at least six will receive the same grade if there are five possible grades A, B, C, D, and E. 2

5. a) Find the number of integers where $1 \leq n \leq 100$ and n is not divisible by 2, 3 or 5. (3)
- b) A total 1232 students have taken a course in Spanish, 879 have taken a course in French and 114 in Russian, Further 103 have taken course in both Spanish and French. 23 have taken both Spanish and Russian 14 have taken both French and Russian. If 2092 students have taken at least one of the three, how many of them have taken a course in all the 3 languages? (2)
6. Define a walk. Prove that, every closed odd walk contains an odd cycle.
7. Prove that every u - v walk contains a u - v path.
8. Prove that, a graph is bipartite if and only if it has no odd cycles.
9. Show that, the center of a tree is a vertex or an edge.
10. Given a graph G and a vertex u in $V(G)$, Dijkstra's Algorithm computes $d(u,v)$ for every v in $V(G)$.