Reg. No. : .....

Name : .....

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C – 2639

First Semester M.Tech. Degree Examination, June 2017
(2013 Scheme)
(2013 Admn.)
COMPUTER SCIENCE ENGINEERING AND INFORMATION SECURITY
RCC1001 : Mathematical Foundations of Computer Science

Time : 3 Hours Max. Marks : 60

Instructions : *Answer* ***any two*** *questions from* ***each*** *Module.*
All *questions carry* ***equal*** *marks.*

MODULE – I

1. a) Let A, B and C be three inhabitants of an Island (two are of the same type if they are both knights or both knaves). Suppose A says "B is a knave" and B says "A and C are the same type". Prove that C is a knave using proof by cases. **5**

   b) Solve the recurrence relation $a_r + a_{r-1} = 3r.2^r$ using characteristic root method. **5**

2. a) Solve the recurrence relation using generating functions $a_r - 7a_{r-1} + 10a_{r-2} = 0$ for $n \geq 2$, given $a_0 = 10$, $a_1 = 41$. **5**

   b) Show that $3^{4n+2} + 5^{2n+1}$ is a multiple of 14 for positive integers, using mathematical induction. **5**

3. a) Prove the following using laws of contra positive. If the product of two integers is even, then at least one of them must be an even integer. **5**

   b) What is temporal logic ? Explain. **5**

MODULE – II

4. a) Determine the number of integers between 1 and 10,000 that are not divisible by 6, 7 or 8. **5**

   b) The capacity of a seminar hall is 800 people. How many people must be there to ensure that at least two people have the same first and last initial ? **5**

P.T.O.

5. a) i) How many permutation can be made with the letters of the word 'MISSISSIPPI' taken all together ?

   ii) How many of there will have vowels occupying the even places ? **5**

   b) i) Show that among 4 numbers, one can find two numbers so that their difference is divisible by 3.

   ii) Using binomial theorem, obtain the coefficient of a^5b^2 in the expression of $(2a - 3b)7$. **5**

6. a) Find the mean of a uniform random variable. **5**

   b) Find the variance of the number of heads obtained from two coin flips. **5**

MODULE – III

7. a) Draw a graph with 6 vertices which is a) Hamiltonian but not Eulerean.
   b) Eulerean but not Hamiltonian. **5**

   b) Applying Graph coloring, how can the final exams of a university be scheduled so that no student has two exams at the same time. **5**

8. a) Prove that any two left or right cosets of a subgroup are either disjoint or identical. **5**

   b) State and explain Warshall's algorithm. **5**

9. a) Show that the order of a subgroup divides the order of the group. **5**

   b) What are decision trees ? Explain. **5**
