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Code No.: 21501

VASAVI COLLEGE OF ENGINEERING (*Autonomous*), HYDERABAD
B.E. II Year (I.T.) I – Semester (Main) Examinations, December – 2015

Discrete Mathematics

Time: 3 hours

Max. Marks: 70

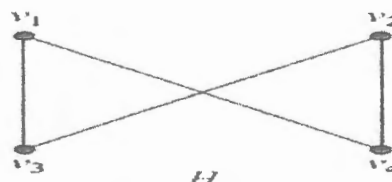
Note: Answer ALL questions in Part-A and any FIVE questions from Part-B

Part-A (10 X 2=20 Marks)

1. How many functions can be defined from a set of size m to a set of size n ?
2. List the rules for inverting a function.
3. What is a left Coset of the group?
4. State the Lagrange's theorem in group theory.
5. Define contradiction. Show that $(p \oplus q) \wedge (p \leftrightarrow q)$ is a contradiction.
6. Show that complement of the graph K_n is null graph.
7. What are the quotients and remainder when 101 is divided by 11?
8. Find the product of $a = (110)_2$ and $b = (101)_2$.
9. State the Pigeonhole Principle.
10. How many binary string are there of length 10?

Part-B (5 X 10=50 Marks)
(All bits carry equal marks)

- 11 a) Let f be the function from $\{a, b, c\}$ to $\{1, 2, 3\}$ such that $f(a) = 2, f(b) = 3,$ and $f(c) = 1$. Is f invertible, and if it is, what is its inverse?
b) What is the symmetric closure of the relation $R = \{(a, b) \mid a > b\}$ on the set of positive integers?
- 12 a) Let R be the additive group of real numbers and R^+ be the multiplicative group of positive real numbers. Show that the mapping $f : R \rightarrow R^+$ defined by $f(x) = e^x \forall x \in R$ is an isomorphism.
b) Show that set of all $n \times n$ non-singular matrices forms a non abelian group.
- 13 a) How can this English sentence be translated into a logical expression?
"You cannot ride the roller coaster if you are under 4 feet tall unless you are older than 16 years old."
b) Verify that following graphs are isomorphic.



Contd...2

- 14 a) Determine whether 17 are congruent to 5 modulo 6 and whether 24 and 14 are congruent modulo 6.
b) What is the decimal expansion of the number with hexadecimal expansion $(2AE0B)_{16}$?
- 15 a) The chairs of an auditorium are to be labelled with an uppercase English letter followed by a positive integer not exceeding 100. What is the largest number of chairs that can be labelled differently?
b) Solve recurrence relation $a_n + a_{n-1} - 6a_n - 2 = 0$ for $n \geq 2$ given that $a_0 = -1$ & $a_1 = 8$.
- 16 a) Out of 30 students in a hostel, 15 study History, 8 study Economics and 6 study Geography. It is known that 3 students study all these subjects. Show that 7 or more students study none of these subjects using principle of inclusion and exclusion.
b) State and prove Burnside's theorem.
17. Write short notes on any two of the following:
a) Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology.
b) Find the binary, octal and hexadecimal expansion of $(12345)_{10}$.
c) Six different symbols are transmitted through a communication channel. A total of 12 blanks are to be inserted between the symbols at least 2 blanks between every pair of symbols. In how many ways can the symbols and the blanks be arranged?
