Hall Ticket Number:

Code No.: 21511 S

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. II Year (I.T.) I-Semester Supplementary Examinations, May/June-2017

Discrete Mathematics

Time: 3 hours Max. Marks: 70

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

Part-A (10 X 2=20 Marks)

1. Construct the truth table for $((p \rightarrow \sim q) \rightarrow (r \wedge p))$.
2. If a and b are odd integers then prove that $a + b$ is even.
3. Express the *gcd* of 124 and 323 as a linear combination of these integers.
4. Prove that the integers a and b are congruent modulo m if and only if there is an integer k such that $a = b + km$.
5. How many license plates can be made using either three letters followed by three digits or four letters followed by two digits?
6. What is the coefficient of x^3y^7 in $(2x - 9y)^{10}$?
7. State Symmetric relation and give an example of it.
8. What is meant by Total order and give an example.
9. Define Isomorphism of graphs and give an example.
10. Define Spanning Tree and give an example.

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

11. a) Define tautology and show that $([p \rightarrow (q \vee r) \wedge \sim q] \rightarrow (p \rightarrow r))$ is a tautology.

    b) What is meant by Proof by Contradiction and hence prove that $\sqrt{5}$ is irrational.

12. a) If p is a prime which does not divide the integer a, then show that $a^{p-1} \equiv 1 \ (mod\ p)$.

    b) If $a = bq + r$, *where a, b, q & r* are integers then prove that *gcd(a, b) = gcd(b, r)* and hence find *gcd(123, 277)*.

13. a) How many solutions are there to the equation $x_1 + x_2 + x_3 + x_4 + x_5 = 21$, where $x_i, i = 1,2,3,4,5$ is a non-negative integer such that $x_i \geq 2$.

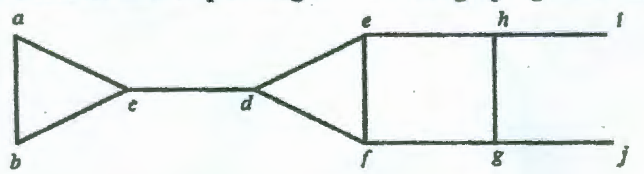
    b) Solve the recurrence relation $a_{n+2} - 3a_{n+1} + 2a_n = n^2 + 2n - 1$.

14. a) Draw the Hasse diagram of $(D_{20}, /)$, where '/' denotes the relation *divisor of* and D_{20} is the set of all divisors of 6. Also determine maximal, minimal, greatest and least elements, if they exists.

    b) Define partial order relation and give an example. Also give an example of a relation which is reflexive and transitive but not symmetric.

15. a) State and prove Euler's formula for planar graphs.

    b) Use depth-first search to find a spanning tree for the graph given below:



Contd... 2

16. a) Using Mathematical Induction prove $1^2 - 2^2 + 3^2 - \ldots\ldots + (-1)^{n-1} n^2 = (-1)^{n-1} \frac{n(n+1)}{2}$, where n is a positive integer.

   b) Define Linear Congruence and hence find the solution of $3x \equiv 4 (mod\ 7)$.

17. Answer any *two* of the following:

   a) Write the combinatorial proof of Pascal's Identity.

   b) Define Equivalence relation. Show that $R = \{(a, b) / a \cong b \ mod\ m\}$ is an equivalence relation on the set of integers.

   c) If 'G' is a connected planar simple graph with 'e' edges and 'v' vertices where $v \geq 3$ then $e \leq 3v - 6$.

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