Hall Ticket Number:

Code No. : 13603

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (I.T. : CBCS) III-Semester Main Examinations, December-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 × 2 = 20 Marks)

1. Which of the following are Propositions? What are the truth values of those that are propositions?
   i) Answer this question.
   ii) $5 + 7 = 10$.
2. Define the principle of Strong Induction.
3. What is the quotient and remainder when -11 is divided by 3?
4. Use Euclidean algorithm to find GCD (123, 277).
5. State Vandermonde's Identity.
6. How many different functions are there from a set with 10 elements to a set with 5 elements?
7. List all the ordered pairs in the relation R = {(a, b) / a divides b} on the set {1, 2, 3, 4, 5, 6}.
8. Represent the relation R={(1,2),(1,3),(1,4),(2,1),(2,3),(2,4),(3,1),(3,2),(3,4),(4,1),(4,2),(4,3)} on {1,2,3,4} with a matrix.
9. How many edges does a graph have if its degree sequence is 4, 3, 3, 2, 2?
10. Define Strongly connected graph and Weakly connected graph.

Part-B (5 × 10 = 50 Marks)

11. a) Show that if n is an integer and $n^3 + 5$ is odd, then n is even using [4]
    i) Proof by Contradiction ii) Proof by Contrapositive.

    b) Prove that $3 + 3.5 + 3.5^2 + \ldots + 3.5^n = 3(5^{n+1} - 1)/4$, where n is a non-negative integer. [6]

12. a) If $a \equiv b \ (mod\ m)$ and $c \equiv d \ (mod\ m)$ then prove that $a + c \equiv (b + d) \ (mod\ m)$ and $ac \equiv bd \ (mod\ m)$. [4]

    b) State and prove Fermat's Little Theorem. [6]

13. a) The English alphabet contains 21 consonants and 5 vowels. How many strings of six lowercase letters of the English alphabet contains i) Exactly one vowel ii) At least one vowel. [4]

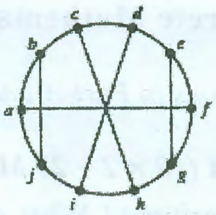
    b) State and prove the Generalized Pigeon-hole principle. [6]

14. a) Draw the Hasse diagram for *inclusion relation* on the set P(S), where S = {a, b, c, d}. Also determine the greatest and least elements, if any, exist. 5 [5]

    b) If R is a relation on the set of ordered pairs of positive integers such that $((a, b), (c, d)) \in R$ if and only if $ad = bc$ then prove that R is an equivalence relation. [5]

15. a) State and prove Euler's formula on planar graphs. [6]

b) Determine whether the given graph is Planar. If so, draw it so that no edges cross. [4]



16. a) Express these statements using quantifiers, predicates and logical connectives if necessary. [5]

i) Every computer science student needs a course in Discrete Mathematics.

ii) There is a student in this class who can speak Hindi.

iii)All users on the campus network can access all websites whose url has a *.edu* extension.

b) Define a Linear Congruence and solve the Linear Congruence $4x \equiv 5 \pmod 9$. [5]

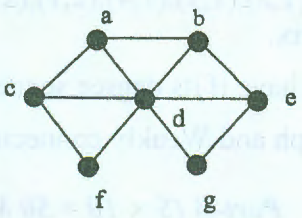
17. Answer any ***two*** of the following:

a) Consider the Non Homogeneous linear recurrence relation $a_n = 3a_{n-1} + 2^n$. Show that $a_n = -2^{n+1}$ is a solution of this recurrence relation. [5]

b) Define *i)* comparable elements of a poset with an example. [5]

ii) Is there a greatest element and a least element in the poset $(Z^+, /)$?

c) *i)* Find the Chromatic number of the given Graph? [5]



ii) Prove that an undirected graph has an even number of vertices of odd degree.

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