VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
B.E. II Year (I.T.) I-Semester (Supplementary) Examinations, May/June-2016

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. How many relations are there on a set with n elements?

2. When a lattice is said to be bounded?

3. Define monoid and cyclic group.

4. State any two properties of a group.

5. Define tautology. Show that for two propositions p and q, $(p \oplus q) \vee (p \leftrightarrow q)$ is a tautology.

6. State the hand shaking theorem in graph theory.

7. Let n and d be positive integers. How many positive integers not exceeding n are divisible by d?

8. What are the quotient and remainder when -11 is divided by 3?

9. How many binary string are there of length 10 containing exactly six 1's?

10. Find the number of bit strings of length four that do not have two consecutive 1s.

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

11. a) Let $f1$ and $f2$ be functions from **R** to **R** such that $f1(x) = x^2$ and $f2(x) = x - x^2$. What are the functions $f1 + f2$ and $f1 f2$?

    b) Find the number of symmetric relations on a set with n elements.

12. a) State and prove Lagrange's theorem.

    b) Show that the set of all positive rational numbers Q^+ forms an abelian group under the composition defined by $a * b = \frac{ab}{2}$

13. a) Show that the following graphs are not isomorphic.
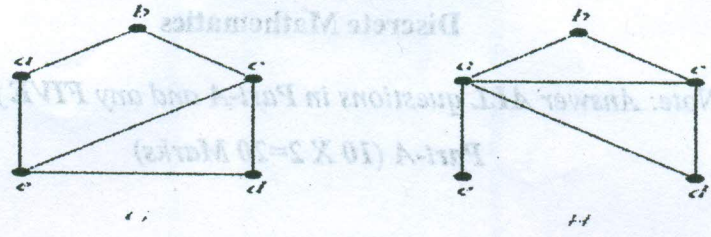
  b) How can this English sentence be translated into a logical expression? "You can access the Internet from campus only if you are a computer science major or you are not a freshman."

14. a) Show that the binary expansion of a positive integer can be obtained from its octal expansion by translating each octal digit into a block of three binary digits.

  b) Find the hexadecimal expansion of $(177130)_{10}$

15. a) How many bit strings of length eight either start with a 1 bit or end with the two bits 00?

  b) A computer company receives 350 applications from computer graduates for a job planning a line of new Web servers. Suppose that 220 of these applicants majored in computer science, 147 majored in business, and 51 majored both in computer science and in business. How many of these applicants majored neither in computer science nor in business?

16. a) Determine whether the function $f(x) = x + 1$ from the set of real numbers to itself is one-to-one.

  b) Prove a subgroup H of a group G is normal subgroup in G if $g^{-1}Hg = H$ for all $g \in G$.

17. Write short notes on any **two** of the following:

  a) Show that $\neg (p \rightarrow q)$ and $p \wedge \neg q$ are logically equivalent.

  b) Give a simple algorithm for forming the two's complement representation of an integer from its one's complement representation.

  c) Solve recurrence relation $a_n - 6a_{n-1} + 9a_{n-2} = 0$ for $n \geq 2$ given that $a_0 = 1$ and $a_1 = 6$

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