# Assignment 04

1. Express the following in terms of propositions and logical connectives (you have to consider implicit assumptions if any): [5]

   Students enrolled for CSE and EEE program are allowed to take discrete mathematics.

2. Check whether $(p \rightarrow r) \vee (q \rightarrow r)$ and $(p \wedge q) \rightarrow r$ are logically equivalent or not[**without using truth table**]. Verify your answer using truth table. [5]

3. Determine whether the compound proposition found in **Q.No.1** is a contradiction or a tautology or a contingency. [5]

4. Express the following in terms of quantified propositional functions and logical connectives. (At first define the necessary propositional functions) [15]

   i) A student in your class has a cat, a dog, and a ferret.

   ii) Some student in your class has a cat and a ferret, but not a dog.

   iii) No student in your class has a cat, a dog, and a ferret.

5. if $3n+7$ is even then $n$ is odd. Prove by contraposition. [5]

6. Prove that, $\sqrt{5}$ is an irrational number. [5]

7. In a version of the computer language BASIC, the name of a variable is a string of one or two alphanumeric characters, where uppercase and lowercase letters are not distinguished. (An alphanumeric character is either one of the 26 English letters or one of the 10 digits.) Moreover, a variable name must not begin with a digit and must be different from the 7 strings of two characters that are reserved for programming use. How many different variable names are there? [10]

8. What is the minimum number of students required in a discrete mathematics class to be sure that at least 8 will receive the same grade, if there are 8 possible grades. [5]

9. What is the coefficient of $x^{12}y^{13}$ in the expansion of $(2x-3y)^{25}$? [5]

10. Each user on a computer system has a password, which is six to eight characters long, where each character is an uppercase letter or a digit. Each password must contain at least one digit. How many possible passwords are there? [10]
11. How many students must be in a class to guarantee that at least two students receive the same score on the final exam, if the exam is graded on a scale from 0 to 100 points? [5]

12. There are 18 mathematics majors and 325 computer science majors at a college. How many ways are there to pick one representative who is either a computer science major or a mathematics major? [5]

13. How many bit strings of length eight either start with a 1 bit or end with the two bits 00? [10]
14. A playoff between two teams consists of at most five games. The first team that wins three games wins the playoff. In how many different ways can the playoff occur? [10]

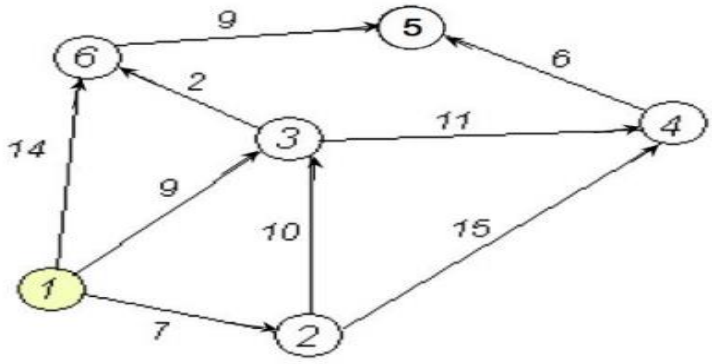
15. What is the probability that a positive integer selected at random from the set of positive integers not exceeding 100 is divisible by both 2 and 5? **[5]**

**16.** You toss a fair coin three times: **[5+5+5]**
    a. What is the probability of three heads?
    b. What is the probability that you observe exactly one head?
    c. Given that you have observed at least one heads, what is the probability that you observe at least two heads?

17. A die is rolled and a coin is tossed. Find the probability that the die shows an odd number and the coin shows a head? **[5]**

18. Two dies are rolled, find the probability that the sum is **[5+5+5]**
    a. Equal to 1
    b. Equal to 4
    c. Less than 13

19. Find shortest path from node 1 to all other nodes using Dijkstra algorithm. [10]

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