Discrete Mathematics - Assignment 2

Deadline: November 9th , 2018, 5PM

Maximum marks: 30

1. Prove by Mathematical Induction principle: Any finite set of n elements has 2n subsets.
2. Let the function f(n) on any natural number n is defined as follows: f(1) = 3, f(2)= 1 and for all n ≥ 3, f(n) = (f(n − 1))^2 + f(n − 2)+1. Prove by any induction principle, that all natural numbers generated by this function are odd.
3. Prove using well ordering principle that the strong induction principle holds for any statement on natural numbers.
4. Prove that there exists a bijective mapping between the sets: (0,1) and (0,1].
5. Give a recursive definition of the set of all integers divisible by 5. Using structural induction, prove that all the elements of your defined set are divisible by 5.
6. Prove that, The difference between any rational number and any irrational number is irrational.
7. Determine whether the following argument is valid or not:
   If any student is good in DM then he/she has good logical ability.
   If any student is good in CP then he/she has good logical ability.
   If any student has good logical ability then he/she can get a good job.
   There are some students who are not good in CP but can get a good job.
8. Apply rules of inference to check whether the following arguments are valid or not:
   i. All students enrolled in IIITS live in a hostel.
   ii. Some of the students enrolled in IIITS are afraid of snakes.
   iii. Any student who live in a hostel, are afraid of snakes iff they do not stay outside after evening.
   iv. Asis is a student enrolled in IIITS who does not stay outside after evening.
   v. Asis is afraid of snakes.
9. Prove that if n is a non-negative integer, then there exists a unique non-negative integer m such that m^2<= n < (m + 1)^2.
10. If x and y are integers, then prove that, x+y is even iff either x and y both, or none of them are even.