

**Shree H.N. Shukla College of Science**

**M.Sc. (Mathematics) Sem-3**

**Prelims Test**

**MATH.CMT-3003: Number Theory - 1**

## [Time: 2.5 Hours] [Total Marks: 70]

1. Answer any seven 7x2=14
2. Give an integer such that
3. State Chinese remainder theorem.
4. Definition : Primitive root
5. Prove that for any
6. Find the highest power of 3 which divides 100!
7. Give an example of Multiplicative function which is not totally multiplicative function.
8. Prove that :
9. Find
10. State fermat theorem.
11. Find the number of positive divisor of 2019.

## Answer any two 2x7=14

* 1. Let a and b be integers such that a ≠ 0 or b ≠ 0 then the GCD of a and b exist and g=gcd(a,b) then g = ax0 + by0 for some integer x0 and y0
  2. Let , p be a prime number. if e= the highest power of p which devides then .
  3. Let then the set is a RRS(mod

1. Answer the following :
2. Let p be a prime number then there is an integer x0 which satisfies x2 + 1 ≡ 0 (mod p) if p=2 or p=4k + 1, for some k. 4

**OR**

(a)Let m≠0 then ax≡ay(mod m) if and only if x≡y ( mod ) 4

1. Solve 3
2. Find the solutions of and use them to find all solutions of . Here 7

4 Answer the following :

1. State and Prove : Euler’s Theorem 7
2. Let and g be a primitive root of m then the set is RRS (mod m) 7 **OR**

(b) State and Prove : Division Algorithm 7

5 Answer the following :

1. Suppose and Then m does not have a primitive root. 4
2. Let p be a prime number and d 1 such that d | p-1 then has exactly d solutions in any CRS(mod p) 5
3. If order of then for any order of 5

**OR**

(c) Prove that There are infinitely many prime numbers. 5

**BEST OF LUCK**