R V COLLEGE OF ENGINEERING

(An autonomous institution affiliated to VTU, Belgaum)

DEPARTMENT OF MATHEMATICS

NUMBER THEORY, VECTOR CALCULUS AND COMPUTATIONAL METHODS (22MA21C)

UNIT 1: NUMBER THEORY

TUTORIAL SHEET – 1

1. By using the Euclidean algorithm, find the greatest common divisor d of 143 and 227 and then find integers x and y to satisfy $143x + 227y = d$. Also show that x and y are not unique.
2. Find the greatest common divisor d of the numbers 272 and 1479 using Euclid's algorithm and then find integers x and y to satisfy $272x + 1479y = d$.
3. Find the remainder when 2^{23} is divided by 47.
4. Find the last digit in 7^{118}.
5. Find the last two digits in 36^{233}.
6. Find the remainder when 175×113×53 is divided by 11.
7. Find the number of positive divisors and sum of all positive divisors of 1363.
8. Find the number of positive divisors and sum of all positive divisors of 8128.
9. Find the solutions of the linear congruence $11x \equiv 4\ (mod\ 25)$.
10. Find the solutions of the linear congruence $25x \equiv 15\ (mod\ 29)$.
11. Find the solutions of the linear congruence $6x \equiv 15\ (mod\ 21)$.
12. Find all distinct solutions of the linear congruence $60x \equiv 35(mod\ 625)$
13. Find the multiplicative inverse of $113\ mod(2036)$.
14. Encrypt the message **STOP** using RSA with key $(e, n) = (13, 2537)$ using the prime number 43 and 59.
15. Given the public key $(e, n) = (7,85)$, encrypt plain text **H C M**, where the alphabets $A, B, C, \ldots X, Y, Z$ are assigned the numbers $3,4, \cdots, 27,28$. Give the cipher text. Find the private key d.