

# Tutorial

Day-1

# Practice problem:

1. Find the result of  $3^{16} \pmod{4}$
2. What is the last digit of  $17^{17}$
3. Find the last three digits of  $2^{40}$
4. Find the product of  $a = (110)_2$  and  $b = (101)_2$
5. Convert binary expansion of each of these integers to a decimal expansion:  
a. 321    b. 1023    c. 100632
6. Convert the octal expansion of each of these integers to a binary expansion: a.  
 $(572)_8$     b.  $(1604)_8$     c.  $(423)_8$     d.  $(2417)_8$
7. Find the value of  $7^{644} \pmod{645}$
8. Find the multiplicative inverses of the following:  
a.  $3 \pmod{26}$                       b. 11 in  $\mathbb{Z}_{26}$

9. Find gcd of (161,28) using extended Euclidean algorithm (hints:  $s_1 = 1$ ,  $s_2 = 0$  and  $t_1 = 0$ ,  $t_2 = 1$  ). Also find the value of s and t
10. Find gcd of (1398, 324) using extended Euclidean algorithm (hints:  $s_1 = 1$ ,  $s_2 = 0$  and  $t_1 = 0$ ,  $t_2 = 1$  )
11. Find a particular and general solutions to the equations  $5x + 22y = 18$
12. Find a solution to the Diophantine equation  $47x + 30y = 1$
13. Find a solution to the linear Diophantine equation  $195x + 42y = 12$
14. Solve x,  $x \equiv 2 \pmod{3}$  ,  $x \equiv 2 \pmod{4}$  ,  $x \equiv 1 \pmod{5}$  by using Chinese remainder theorem
15. Find the value of x,  $x \equiv 1 \pmod{3}$  ,  $x \equiv 1 \pmod{4}$  ,  $x \equiv 1 \pmod{5}$ ,  $x \equiv 0 \pmod{7}$  chinese remainder theorem

**Thank you**