Tutorial-3

I Find Euler's Petro function for the following: 1) \$\phi(29) \quad 2) \$\phi(80) 3) \$\phi(100) \quad Here n= 29 n is a prime number O(n) = n-1 0(29) = 28. 2) 0(80) hou n=80. $n = 16 \times 5 = 24 \times 5$ Distinct prime factors are 2 & 5 $\phi(n) = m \times \left(1 - \frac{1}{P_1}\right)\left(1 - \frac{1}{P_2}\right)$ $\phi(80) = 80(1-1)(1-1) = 80\times1\times4^{2}$ \$\(\phi(80) = 32\) 3) \$(100) here n= 100 $M = 25 \times 4 = 5^2 \times 2^2$ Distinct prime factors are 2 and 5 $\phi(100) = 100 \times \left(1 - \frac{1}{2}\right) \left(1 - \frac{1}{5}\right)$ = 100×1×42 \$ (100)=40.

meham bely M

4) \$ (101)

here n=101

 $\phi(n) = n-1 \Rightarrow \phi(101) = 100$

2. Find the value of x for the following set of congruence using chinese remainder theorem.

a) x = 2 mod 7 & x = 3 mod 9 3 1000 (12 + 27)

6) x = 4 mod 5 & x = 10 mod 11

> a) x= 2 mod 7 & x=3 mod 9

a1=2, a2=3, m1=+, m2=9.83 homos x

X = (a, M, M, + a, M2 M2) mod M. 08 = X

 $M = m_1 m_2 = 63$.

 $M_1 = M = 63 = 9$; $M_2 = M = 63 = 7$ $M_1 = 7$ $M_2 = 9$

M, Mi = I mod m,

9MT = 1 mod 7.

M-1 = 9-1 mod 7.

	0	A	13	R	Tı	T2	T
	0	7	9	7	0	1	0
	1	9	7	2	1	0	1
-	3	7	2	1	0	1	-3.
	2	2	1	0	1	-3	7.
		1	0		-3	7	

> Mi = -3 mod 7

M1 = 4

M2M2 = 1 mod m2

7 M2 = 1 mod 9

M2 = 7 mod 9.

0	A	B	R	T.	To	T
					1	
						4
2	2	1	0	-100	4	-9
	1	0			-9	

M= = 4 mod9

M51=4

=> X = (2x9x4 + 3x7x4) mod 63

= (72+84) mod 63.

= (72 mod 63 + 84 mod 63) mod 63

= (9+21) mod 63 home = x 8 = 160 mo e = 4

X = 30 mod 63

=> x = 30. M home (to M aM aD + to M M a) - x

b) X = 4 mod 4 & X = 10 mod 11.

a,=4, a2=10, m,=4, m2=11

M=m,m2=44

 $M_1 = M = 44 = 11$ $M_1 = 4$

 $M_2 = M = 44 = 4$

M, Mi = 1 mod m,

11 Mi = 1 mod 4

Mi = 11 mod 4

		-	White Street or other Designation of the last	THE RESERVE OF THE PERSON NAMED IN	THE RESERVE TO SHARE SHARES	STREET, SQUARE, SQUARE,	the Real Property lies	_
1000	0	A	B	R	ब्र ७	T2 8	T	
	0	4	11	4	0	1	0	-6
	2	11	4	3	1	0	1	
	1	4	3	1	0	1	1	ino
	3	3	1	0	1	-1	14	150
		1	0		-1	4	PI	ton

Mi = -1 mod 4 = 3 mod 4

=> M; =3

M2M2 = 1 mod m2.	FI Some Folia							
4 M2 = 1 mod 11								
Mo-1 = 4-1 mod 11								
Q A B R T, T2 T								
1 4 3 1 1 -2 3								
3 3 1 0 -2 3 -1								
1 0. 10030 -100	2							
=> M2 = 3 mod 11	E plant as							
$M_2^{-1} = 3$.	= Filogonia							
X = (a, M, M, + a2 M2 M2) mod M								
= (4x11x3 + 10x4x3) mod 44								
= (132 + 120) mod 44.								
= (030 × 100 × 10) mock 44.								
= (220+32)mod 44								
= (220mod 44 + 32 mod 44) mod 44								
= (0+32)mod44								
⇒ X = 32.								
3 Find result of following using Fer	mant's little theorem							
	3 Find result of following using Fermant's little theorem a) 5-1 mod 13 b) 15-1 mod 17							
) 5-1 mod 13								
$a^{P-1} \equiv 1 \mod p$	WO ME & MISSESSON							
	$\Rightarrow a^{-1} \mod p \equiv a^{p-2} \mod p.$							
$5^{-1} \mod 13 \equiv 5^{13-2} \mod 13$								
= 5"mod 13								
= (25 ⁵ mod 13 × 5 mod 13) mod 13								
	= (-15 mod 13 x 5 mod 13) mod 13							
= (-1×5)mod 13								
=-5mod 13								
⇒ 5 mad 13 = 8 mod 13.								
61 mod 13 = 8//								

b) 15 mod 17 at mod p = ap-2 mod p 15 mod 17 = 1517-2 mod 17 = 1515 mod 17. = (-2)15 mod 17 = (-1)(8)(16)3mod 17 = ((-1 mod 17)(8 mod 17)(163 mod 17)) mod 17 = (=16x8x16)mod17. 15 mod 17 = 8 mod 17 15 mod 17 = 8 Can ligary a & Et born E -5 mad 13 = smod 13