University of Technology

Department of Computer Sciences

Final Examination 2012-2013

الدور الثاني

Subject: Number Theory:
Division : امنيه بيا ناقشه
Examine :asset prof Dr. Hanaa M. A. Salman

Year: 2012-2013
Time: 3 Hours
Date: /9 /2013

Not: Answer Three Questions Only

يمنع استخدام الحاسبه

Q: 1

A. find if the Divides is acceptable

1. -8 ∤ 4,
2. -3|-6,
3. -5|5

B. find the correct answer for

1. what are the multiples of 4 between -25 and 25
2. what are the multiplies of 5 between -42 and 42
3. for what integer a is 1|a true
4. for what integer a is a|0 true

C. find all the primes up to $-55 \leq x \leq 20$

D. show if the following numbers are Fermat numbers and Fermat prime number

6. $2^{2^2}+1$,
7. $2^{2^3}+1$,
8. $2^{2^7}+1$

Q:2

A. Find the q and r guaranteed by the division algorithm for each pair a, b

a	B
7	-30
43	-500

a	b
9	-29
47	-500

B. What are all the common divisors of 12 and 18

C. What are the common divisors of 27 and 18

D. Compute gcd(-24,-63) using the Euclidean Algorithm

Q:3

A. Let gcd(188,158)=2 find x,y such that gcd(188,158)=188.x+158.y

B. Find all the residue classes for n, such that $0 \leq n \leq 34$

1. **Find all the prime residue classes of n**
2. **Find all the non-negative residue classes of n**
3. **Find all the odd residue classes of n**
4. **Find a system**
5. **Find a representation for the system**

C. Expand the rational numbers. $\frac{51}{239}$ as simple continued fractions

D. Find all the solutions to

X≡1 mod 2
X≡2 mod 3
X≡3 mod 5
X≡4 mod 11

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Q:4

A. show if the following are congruences or incongruences.

1. $35 \equiv 11 \pmod{12}$
2. $35 \not\equiv 12 \pmod{11}$
3. $35 \equiv 2 \pmod{11}$
4. $1 \equiv 7 \pmod{6}$
5. $2 \not\equiv 7 \pmod{6}$

B. if n=M

1. Find the least residue of b mod n
2. Find the complete system residue of b mod n
3. Find all residue of b mod n
4. Find all the prime residue of b mod n
5. Find the least prime residue of b mod n
6. Find the complete system for the prime residue of b mod n

where

M=7, b=100

M=51, b=-30

C. : solve the bellow

1. $[7]_{12} +_{12} [8]_{12}$
2. $[7]_{17} +_{17} [8]_{17}$
3. $[77]_{12} +_{12} [9]_{12}$
4. $[7]_{12} -_{12} [8]_{12}$
5. $[7]_5 -_5 [8]_5$
6. $[77]_{12} -_{12} [9]_{12}$
7. $[7]_{12} *_{12} [8]_{12}$
8. $[7]_5 *_5 [8]_5$
9. $[7]_{17} *_{17} [8]_{17}$
10. $[77]_{12} *_{12} [9]_{12}$

D. Find gcd(a,b) for each pair in problems from 1 through 12 using the Euclidean algorithm then solve the equation backwards to find x,y such that ax+by=gcd(a,b).

a	B
17	51
19	0

a	b
21	1
35	0