EE2302 Foundations of Information Engineering

Assignment 4 (Solution)

1. Any integer n can be written as $n = 3q + r$ using the quotient-remainder theorem, where $0 \leq r < 3$. There are three possible cases:
   - For $r = 0$, $n^2 = (3q)^2 = 3(3q^2) = 3k$ for $k = 3q^2$.
   - For $r = 1$, $n^2 = (3q+1)^2 = 9q^2 + 6q + 1 = 3(3q^2 + 2q) + 1 = 3k + 1$ for $k = (3q^2 + 2q)$.
   - For $r = 2$, $n^2 = (3q+2)^2 = 9q^2 + 12q + 4 = 3(3q^2 + 4q + 1) + 1 = 3k + 1$ for $k = (3q^2 + 4q + 1)$.

   Therefore, the square of any integer has the form $3k$ or $3k$+1 for some integer k.

2. $\emptyset(560) = \emptyset(2^4 * 5 * 7)$

   $= \emptyset(2^4)\emptyset(5)\emptyset(7)$

   $= 2^3(2-1)(5-1)(7-1)$
   $= 192.$

3. $\gcd(46288,2046) = 22$

22	46288 45012	2046 1276	1
1	1276 770	770 506	1
1	506 264	264 242	1
1	242 22	22 0	22

4.

10245	1689		
1	0	10245	a
0	1	1689	b
1	-6	111	c = a – 6b
-15	91	24	d = b – 15c
61	-370	15	e = c – 4d
-76	461	9	f = d - e
137	-831	6	g = e - f
-213	1292	3	h = f - g

$\gcd(10245,1689) = 3$, $x = -213$ and $y = 1292$.