Quiz Questions: Number Theory

1. A number greater than 33 would require a minimum of how may bits in binary representation?
   A. 6
   B. 7
   C. 10
   D. 34

2. The hexadecimal expansion of $(1010101011)_2$ is:
   A. 283
   B. 263
   C. 2AB
   D. 2A3

3. A multiplicative inverse of 6 modulo 10 is?
   A. There is no multiplicative inverse of 6 modulo 10.
   B. -2
   C. -4
   D. 1/6

4. a, b are integers with $a = -4, b = -9$. Find $c \in \{0,1, \dots ,12\}$ such that $c = 2a + 3b(mod 13)$
   A. 0
   B. 4
   C. 9
   D. 11

5. Which of the following is correct for all $n \geq 2$? (congruences)
   A. $(n-1)! = n! \pmod{(n+1)!}$
   B. $(n-1)! = (n+1)! \pmod{(n!)}$
   C. $n! = (n+1)! \pmod{(n-1)!}$
   D. None of the above.

6. What is the product of $(100101)_2$ with $(011)_3$
   A. $(1202)_4$
   B. $(2101)_4$
   C. $(2110)_4$
   D. $(1210)_4$

7. Let p be a prime number. How many different prime divisors does p^3 have?
   A. 0
   B. 1
   C. 2
   D. 3

8. What is the prime factorization of $(7!)^{2!}$?
   A. $2^4 \cdot 3^2 \cdot 5 \cdot 7$
   B. $2^6 \cdot 3^4 \cdot 5^2 \cdot 7^2$
   C. $2^8 \cdot 3^2 \cdot 5^2 \cdot 7^2$
   D. $2^8 \cdot 3^4 \cdot 5^2 \cdot 7^2$

Answers:

1. A
2. C
3. A
4. B
5. C
6. C
7. B
8. D