

SC 611 Mathematics for Computer Science

Home Work3

week: Aug 12, 2011

Tutorial Discussion Week: Aug 19, 2011

Tutorial Submission Deadline: Aug 23, 2011

1.
 - (a) Convert the decimal number 136 into the following number systems.
 - i. *Binary*
 - ii. *Octal*
 - iii. *Hexadecimal*
 - (b) Convert the binary number 10010101 into the following number system and find n' 's complement in each number system including binary number system ($n=2$). Where n is base of the number system.
 - i. *Decimal* ($n = 10$)
 - ii. *Octal* ($n = 8$)
 - iii. *Hexadecimal* ($n = 16$)

2. Consider the following matrices.

$$A = \begin{bmatrix} 2 & 3 & 1 \\ 0 & 0 & 5 \end{bmatrix}, B = \begin{bmatrix} 7 & 0 \\ 0 & 5 \\ 1 & 0 \end{bmatrix}$$

Find

- (a) $A + B^T$
 - (b) $A^T - B$
 - (c) AB
 - (d) $A \odot B$
 - (e) $(AB)^{-1}$
3. Construct a $GF(8)$ field using an equation $1 + x + x^3 = 0$ and again using $1 + x^2 + x^3 = 0$. What is the relationship in both the fields?
4.
 - (a) Encrypt *howareyou* using affine function $5x + 7 \pmod{26}$. What is the decryption function? Check that it works with example.
 - (b) Solve the following congruence for x .
 - i. $4x \equiv 5 \pmod{9}$
 - ii. $2x \equiv 7 \pmod{17}$

5. Books are identified by an **International Standard Book Number (ISBN)**, a 10 digit code $x_1x_2 \dots x_{10}$. The last digit (x_{10}) is check digit and is selected so that

$$\sum_{i=1}^{10} ix_i \equiv 0 \pmod{11}$$

- (a) The first nine digits of the **ISBN** of the third edition of this book are 0 – 07 – 053965. What is the check digit for this book?
- (b) The **ISBN** of *Elementary Number Theory and Its Applications*, 3rd ed., is 0 – 201 – 57Q89 – 1, where Q is a digit. Find the value of Q
- (c) Determine whether the check digit of the **ISBN** for *Discrete Mathematics and Its Applications* by *Kenneth H. Rosen* was computed correctly by the publisher.