CSS 322 – QUIZ 2 ANSWERS

First name: _____ Last name: _____

ID: _____ Total Marks: _____

out of 10

Question 1 [2 marks]

Explain an advantage of the Feistel structure for block ciphers.

Answer

The Feistel structure uses multiple rounds. The advantage of this is that the round Function can be simple (to implement), relative to a structure that used 1 round which aimed to provide same level of security. That is, repeating the round Function many times provides equivalent security to have one large, complex Function.

The Feistel structure allows substitution operations to be performed on small sized blocks, rather than the full block size. Such operations are therefore more efficient to implement/perform.

Question 2 [4 marks]

True or false:

a) The decryption procedure for DES is the inverse of the encryption procedure. **T** F

b) A desirable property of an encryption algorithm is that small changes in key values produces small changes in the output ciphertext. T **F**

c) A desirable property of an encryption algorithm is that small changes in plaintext values produces large changes in the output ciphertext. **T** F

d) The Initial Permutation in DES adds security to the overall algorithm by providing *diffusion* of the bits. T **F**

e) The Initial Permutation in DES adds security to the overall algorithm by providing *confusion* of the bits. T **F**

f) Rijndael works with multiple key sizes and multiple block sizes. **T** F

g) Rijndael produces different ciphertext which is different in length to the input plaintext T **F**

Question 3 [4 marks]

The following information is shows part of the decryption procedure for Simplified AES (including the decryption S-Box, mix columns matrix and GF(2^4) multiplication table). Given the values of A and K2, determine the values of B, C, D and E.

K2: 0101 0101 1001 0000

A: 1101 0000 0000 1001

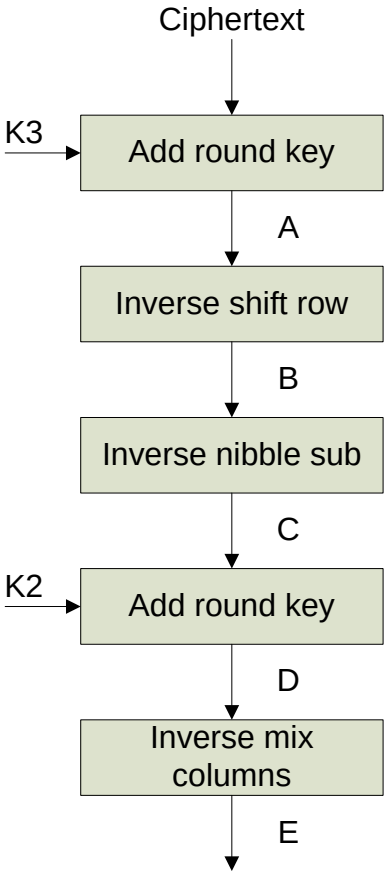
B: __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __

C: __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __

D: __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __

E: __ __ __ __ X X X X X X X X __ __ __ __

(that is, you only need to calculate the first and fourth nibble for E)



$$\begin{bmatrix} 1010 & 0101 & 1001 & 1011 \\ 0001 & 0111 & 1000 & 1111 \\ 0110 & 0000 & 0010 & 0011 \\ 1100 & 0100 & 1101 & 1110 \end{bmatrix}$$

$$\begin{bmatrix} 9 & 2 \\ 2 & 9 \end{bmatrix}$$

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2	0	2	4	6	8	A	C	E	3	1	7	5	B	9	F	D
3	0	3	6	5	C	F	A	9	B	8	D	E	7	4	1	2
4	0	4	8	C	3	7	B	F	6	2	E	A	5	1	D	9
5	0	5	A	F	7	2	D	8	E	B	4	1	9	C	3	6
6	0	6	C	A	B	D	7	1	5	3	9	F	E	8	2	4
7	0	7	E	9	F	8	1	6	D	A	3	4	2	5	C	B
8	0	8	3	B	6	E	5	D	C	4	F	7	A	2	9	1
9	0	9	1	8	2	B	3	A	4	D	5	C	6	F	7	E
A	0	A	7	D	E	4	9	3	F	5	8	2	1	B	6	C
B	0	B	5	E	A	1	F	4	7	C	2	9	D	6	8	3
C	0	C	B	7	5	9	E	2	A	6	1	D	F	3	4	8
D	0	D	9	4	1	C	8	5	2	F	B	6	3	E	A	7
E	0	E	F	1	D	3	2	C	9	7	6	8	4	A	B	5
F	0	F	D	2	9	6	4	B	1	E	C	3	8	7	5	A

Answers

K2: 0101 0101 1001 0000

A: 1101 0000 0000 1001

B: 1101 1001 0000 0000 (1/2 mark)

C: 0100 0000 1010 1010 (1 mark)

D: 0001 0101 0011 1010 (1/2 mark)

E: S00: 9*1 + 2* 5 = 9 + A = 1001 XOR 1010 = 0011

S11: 2*3 + 9*A = 6 + 5 = 0110 XOR 0101 = 0011

K2:

A: 0110 0100 0110 0011

B: 0110 0011 0110 0100 (1/2 mark)

C: 1000 1011 1000 0001 (1 mark)

D: 1110 1111 1110 0010 (1/2 mark)

E: S00: 9*D + 2* F = F + D = 1111 XOR 1110 = 0001

S11: 2*D + 9*2 = 9 + 1 = 1001 XOR 0001 = 1000