Q1) Two different senders want to encrypt the same plain text with two different keys using Playfair cipher. The first sender is use key=access, while the second one uses the key= aces. Is the cipher text in the two cases are same or not? Explain your answer? [2 Marks]

There are not different between the two cases because of in Playfair cipher, the repeated letters in the key should be removed.

Q2) Encrypt the last two letters from the plain text (box) using Hill cipher with key=$\begin{bmatrix} 1 & 2 \\ 3 & 1 \end{bmatrix}$? [3 Marks]

The last two letters are xx≡ [23 23]

$$[23 \quad 23] \times \begin{bmatrix} 1 & 2 \\ 3 & 1 \end{bmatrix} = [23 + 69 \quad 46 + 23] \, mod \, 26 = [14 \quad 17] \equiv OR$$

Q3) Decrypt (awystyzrdxheaynndmexprftspooux) using columnar cipher with key=letter?

[3 Marks]

L	E	T	T	E	R
3	1	5	6	2	4
H	A	P	P	Y	N
E	W	R	O	Z	D
A	Y	F	O	R	M
Y	S	T	U	D	E
N	T	S	x	x	x

Plain text= Happy Newroz Day for My Students

Q4) Find w_8 for AES key expansion if you know that the round1 key=E2 32 FC F1 91 12 91 88 B1 59 E4 E6 D6 79 A2 93? [4 Marks]

Firstly, we should find $g(w_7)$:

W_7= D6 79 A2 93

Rot word=79 A2 93 D6

Sub word=B6 3A DC F6

$g(w_3)= rs_2 \oplus Rcon_2$ = B6 3A DC F6⊕02 00 00 00=B4 3A DC F6

$w_8 = w_4 \oplus g(w_7)$= E2 32 FC F1 ⊕B4 3A DC F6

8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1
1	1	1	0	0	0	1	0	0	0	1	1	0	0	1	0	1	1	1	1	1	1	0	0	1	1	1	1	0	0	0	1
1	0	1	1	0	1	0	0	0	0	1	1	1	0	1	0	1	1	0	1	1	1	0	0	1	1	1	1	0	1	1	0
0	1	0	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1
56								08								20								07							

Q5) Find the missing cells from AES mixing column operation: [3 Marks]

$$\begin{bmatrix} 02 & 03 & 01 & 01 \\ 01 & 02 & 03 & 01 \\ 01 & 01 & 02 & 03 \\ 03 & 01 & 01 & 02 \end{bmatrix} \times \begin{bmatrix} 63 & EB & 9F & A0 \\ 2F & 93 & 92 & C0 \\ AF & C7 & AB & 30 \\ A2 & 20 & CB & 2B \end{bmatrix} = \begin{bmatrix} BA & 84 & E8 & 1B \\ 75 & A4 & 8D & 40 \\ F4 & ? & ? & 7D \\ 7A & 32 & 0E & 5D \end{bmatrix}$$

Finding cell 3,3

$$01 \times 9F = 01 \times 10011111 = 10011111$$

$$01 \times 92 = 01 \times 10010010 = 10010010$$

$$02 \times AB = 01 \times 10101011 = 01010110$$

$$00011011$$

$$03 \times CB = 01 \times 11001011 = 11001011$$

$$10010110$$

$$00011011$$

_____XOR

00000110=06

Finding cell 3,2

$$01 \times EB = 01 \times 11101011 = 11101011$$

$$01 \times 93 = 01 \times 10010011 = 10010011$$

$$02 \times C7 = 01 \times 11000111 = 10001110$$

$$00011011$$

$$03 \times 20 = 01 \times 00100000 = 00100000$$

$$01000000$$

_____XOR

10001101=8D