|  |  |
| --- | --- |
| EGC_Black | EASTERN GOLDFIELDS COLLEGE  MATHEMATICS APPLICATIONS U1 - 2017    **Investigation 2** |

Take home section (Part A) and calculator assumed Time: 55 min

**Part A –** 🞏 **Submitted** **Part B \_\_\_\_\_\_\_\_\_\_ / 51**



**ALPHABET CODES**

**- MATRICES -**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. **Encode** “MORE AMMO URGENT”, following these steps: **(12 marks)**

a) Write the message in numbers. (1 marks)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

b) Write these as a series of matrices. (4 marks)

c) Multiply these matrices by the encoding matrix, which is

(4 marks)

= =

= =

Complete the table below by following these steps: (3 marks)

d) Write the resulting code.

e) Rewrite the code after subtracting 27 from the values where necessary.

f) Change back into letters, ready to send.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| d) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| e) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| f) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

2. **Decode** the following message, using the **encoding** matrix

**(14 marks)**



1. Covert to numbers (1 mark)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **R** | **X** | **H** | **E** | **S** | **R** | **K** | **-** | **R** | **P** | **P** | **X** | **Q** | **E** | **E** | **V** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

1. What is the **decoding** matrix **to be** used? (2 marks)
2. Apply the decoding matrix. (8 marks)

(3 marks)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| d) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| e) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| f) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

3. Messages can also be sent in code by **adding** matrices together. Consider the following

message: **(6 marks)**

**ONE BEER NOW**

a) Assign a number to each letter. (1 mark)

**O N E − B E E R − N O W**

15 14 5 27

b) Set up 2 x 2 matrices for these. (1 marks)

c) Use the **encoding** 2 x 2 matrix to encode the message. (2 marks)

+ =

d) Reassign letters to complete the message. Remember to take 27 from those numbers greater

than 27.

(2 marks)

17 21 18 32

**Q U R E**

4. To decode the message a **decoding** matrix is needed. The decoding matrix is  

Use this decoding matrix to decode the message below. **(8 marks)**

**V O N Y U G V Y**

5. Perform the following calculations or state if they cannot be determined. **(5 marks)**

A = B = C = D =

a) A + D

b) 3A – D

c) C - 2B

6. When multiplying two matrices in the method you have used means that:

*Two matrices can be multiplied together provided the number of columns   
in the first matrix equals the number of rows in the second matrix*

Knowing this and using the matrices from question 5, perform the following calculations or state if they cannot be determined. **(6 marks)**

|  |  |
| --- | --- |
| 1. A x B | 1. A x D |
| 1. C x 2B | 1. B² |

END OF PART B