FURTHER MATHEMATICS **Name**_____

27 marks

UNIT 4 **ASSIGNMENT**

TEST CONDITIONS (45 minutes) **UNIT 4 – 0 1**

Question 1
What is the order of this matrix:

$$\begin{bmatrix} 2 & 3 & 5 \\ 1 & 2 & 1 \\ -5 & 2 & 0 \\ 0 & 10 & -4 \end{bmatrix}$$

A. 4 x 2 B. 3 x 2 C. 3 x 3

D. 4 x 3 E. 3 x 4

Question 2
A matrix of order (a x b) is multiplied by a matrix of order (c x d). The matrices can only be multiplied if:

A. $a = b = c = d$ B. $a = d$ C. $a = c$

D. $b = c$ E. Both matrices are of the same order

Question 3

If $G = \begin{bmatrix} 2 & 5 & 0 \\ -1 & -4 & 3 \end{bmatrix}$ then the value of element $g_{2,1}$ is:

A. -1 B. 0 C. 2

D. 3 E. 5

Question 4

If $V = \begin{bmatrix} 3 & 1 \\ 0 & 4 \end{bmatrix}$ and the matrix product $LV = \begin{bmatrix} 3 & 5 \\ 7 & 2 \\ 1 & 0 \\ 2 & 10 \end{bmatrix}$ then the order of matrix L is:

A. 2 x 2 B. 2 x 4 C. 3 x 4

D. 4 x 2 E. 4 x 4

Question 5

Three teams, Blue (B), Green (G) and Red (R), compete for three different sporting competitions. The table below shows the competition winners for the past three years.

	Athletics	Cross country	Swimming
2004	Green	Green	Blue
2005	Green	Red	Blue
2006	Blue	Green	Blue

A matrix that shows the total number of competitions won by each of the three teams in each of the three years could be:

A. $\begin{matrix} & B & G & R \\ 2004 & 1 & 1 & 1 \\ 2005 & 1 & 1 & 1 \\ 2006 & 1 & 1 & 1 \end{matrix}$

B. $\begin{matrix} & B & G & R \\ 2004 & 1 & 2 & 0 \\ 2005 & 1 & 1 & 1 \\ 2006 & 2 & 1 & 0 \end{matrix}$

C. $\begin{matrix} & B & G & R \\ 2004 & 1 & 2 & 0 \\ 2005 & 1 & 1 & 1 \\ 2006 & 1 & 1 & 0 \end{matrix}$

D. $\begin{matrix} & B & G & R \\ 2004 & 4 & 0 & 0 \\ 2005 & 0 & 4 & 0 \\ 2006 & 0 & 0 & 1 \end{matrix}$

E. $\begin{matrix} & B & G & R \\ 2004 & 2 & 1 & 0 \\ 2005 & 2 & 0 & 1 \\ 2006 & 0 & 3 & 0 \end{matrix}$

Question 6

$Y = \begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix}$, therefore Y^T equals

A. $\begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix}$

B. $\begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 0 & -1 \\ 1 & 2 \end{bmatrix}$

D. $\begin{bmatrix} 2 & 1 \\ -1 & 2 \end{bmatrix}$

E. $\begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$

Question 7

A company makes Regular(R) , Queen (Q) and King (K) size beds. Each bed comes in either the Classic style of the more expensive Deluxe style. The price of each style of bed, in dollars, is listed in a price matrix *P*, where

$$P = \begin{matrix} \\ Classic \\ Deluxe \end{matrix} \begin{matrix} \begin{matrix} R & Q & K \end{matrix} \\ \begin{bmatrix} 145 & 210 & 350 \\ 185 & 270 & 410 \end{bmatrix} \end{matrix}$$

The company wants to increase the price of all beds. A new price matrix, listing the increased price of the beds, can be generated from P by forming a matrix product with the matrix, M, where:

$$M = \begin{bmatrix} 1.2 & 0 \\ 0 & 1.35 \end{bmatrix}$$

This new price matrix is:

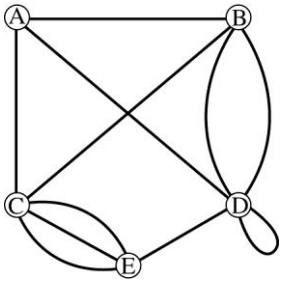
A. $\begin{bmatrix} 145 & 210 & 350 \\ 185 & 270 & 410 \end{bmatrix}$ B. $\begin{bmatrix} 234.90 & 340.20 & 567.00 \\ 299.70 & 437.40 & 664.20 \end{bmatrix}$ C. $\begin{bmatrix} 174 & 252 & 420 \\ 222 & 324 & 492 \end{bmatrix}$

D. $\begin{bmatrix} 174 & 252 & 420 \\ 249.75 & 364.50 & 553.50 \end{bmatrix}$ E. $\begin{bmatrix} 195.75 & 283.50 & 472.50 \\ 249.75 & 364.50 & 553.50 \end{bmatrix}$

Short Answer (20 marks):

Question 1 (3 marks)

Represent the following network diagram as a matrix:



Question 2 (3 marks)

If $A = \begin{bmatrix} 8 & -3 \\ 2 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 \\ 0 & 5 \end{bmatrix}$, then find:

a) $A + B$

b) $2B + 3A$

c) $2B - A^2$

(1 + 1 + 1 = 3 marks)

Question 3 (4 marks)
Use matrix multiplication (show working) to construct a matrix that displays

a) row sums of the matrix $\begin{bmatrix} 2 & 5 \\ 3 & -2 \\ 2 & 1 \end{bmatrix}$

b) column sums of the matrix $\begin{bmatrix} 3 & -5 & 6 \\ -1 & -2 & 3 \end{bmatrix}$

(2+2 = 4 marks)

Question 4 (5 marks)

Three types of cheese, Cheddar (C), Gouda (G) and Blue (B), will be bought for a school function. The cost matrix, P lists the prices of these cheeses, in dollars, at two stores, Foodway and Safeworth.

$$P = \begin{bmatrix} 6.80 & 5.30 & 6.20 \\ 7.30 & 4.90 & 6.15 \end{bmatrix} \begin{matrix} Foodway \\ Safeworth \end{matrix}$$

a) What is the order of matrix P.

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1 mark

The number of packets of each type of cheese needed is listed in the quantity matrix Q.

$$Q = \begin{bmatrix} 8 \\ 11 \\ 3 \end{bmatrix} \begin{matrix} C \\ G \\ B \end{matrix}$$

b) i) Evaluate the matrix $W = PQ$.

1 mark

ii) At which store will the total cost of the cheese be lower? State this cost.

2 marks

c) Explain why it is not possible to find the matrix product QP.

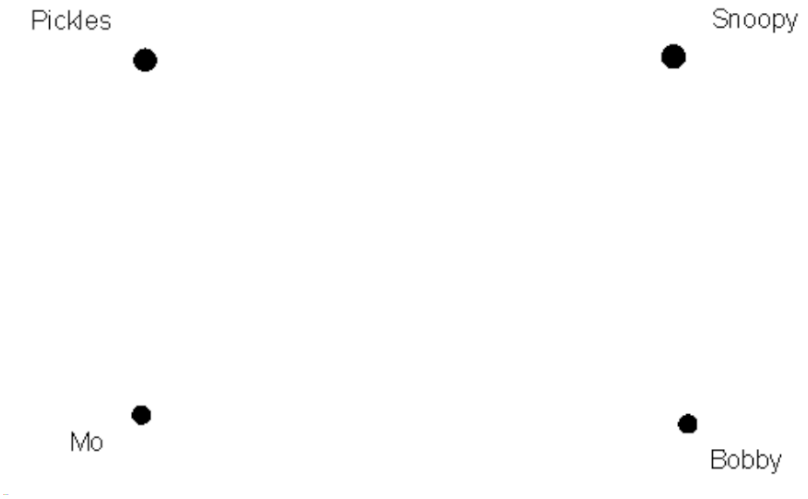
1 mark

Question 5 (5 marks)

Pickles, Snoopy, Mo and Bobby are four dogs who like to play and walk together. A dominance hierarchy exists amongst the dogs as follows:

Pickles has dominance over Snoopy only
Snoopy has dominance over Mo and Bobby
Mo has dominance over Pickles only
Bobby has dominance over Pickles and Mo

a) Draw a directed graph below that displays this information using arrows from the dominant dog to the other dog to indicate a dominance relationship.



2 marks

b) Explain the 2-step dominance that Bobby has over Snoopy.

1 mark

c) Complete the table below with the total of one-step and two-step dominances for each dog.

Dominance Order	**Total**
Snoopy	
Bobby	
Pickles	
Mo	

2 marks