



PRIFYSGOL CYMRU

Y Drindod Dewi Sant

UNIVERSITY OF WALES

Trinity Saint David

Examination Answer Book

24 Pages

Instructions to candidates

Please give the information requested in the boxes below.

Enter your name in the space provided to the right and seal to hide your name.

The answers must be **legibly** written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.

Write your answers in ink.

Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.

No part of this book is to be torn out; it must be handed in complete.

If more books than one are used, fasten them together using the tags available from the invigilator(s).

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Student Number	1703645
Title of Examination Paper	Marks
Module Code	
Date and Time of Examination	15/02 1415
Examination Venue	
Seat Number	
Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
1	12/18 ✓
2	6/6 ✓
3	12/16 ✓
4	7/9 ✓
5	8/8 ✓
6	7/7 ✓
7	7/7 ✓
8	1 1/2/9 ✓
Total	60 1/2 ✓

75/1
80

Please complete this section and SEAL before the examination starts.

Surname Lewington Forename(s) Matthew Dene (Block Capitals)

Complete section, remove strip, fold as indicated and SEAL

PULL & TEAR

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$$i) A = \begin{bmatrix} 1 & -3 & 2 \\ 4 & 0 & 2 \\ 5 & 1 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 2 & 1 & -3 \\ 0 & -1 & -1 \\ 4 & 2 & 1 \end{bmatrix}$$

$$i) AB = (1 \times 2) + (-3 \times 0) + (2 \times 4), (1 \times 1) + (-3 \times -1) + (2 \times 2), (1 \times -3) + (-3 \times -1) + (2 \times 1) \\ (4 \times 2) + (0 \times 0) + (2 \times 4), (4 \times 1) + (0 \times -1) + (2 \times 2), (4 \times -3) + (0 \times -1) + (2 \times 1) \\ (5 \times 2) + (1 \times 0) + (1 \times 4), (5 \times 1) + (1 \times -1) + (1 \times 2), (5 \times -3) + (1 \times -1) + (1 \times 1)$$

$$AB = \begin{matrix} 2 + 0 + 8 & 1 + 3 + 4 & -3 + 3 + 2 \\ 8 + 0 + 8 & 4 + 0 + 4 & -12 + 0 + 2 \\ 10 + 0 + 4 & 5 + (-1) + 2 & -15 + (-1) + 1 \end{matrix}$$

$$AB = \begin{bmatrix} 10 & 8 & 2 \\ 16 & 8 & -10 \\ 14 & 6 & -15 \end{bmatrix}$$

$$ii) A-B = \begin{bmatrix} -1 & -3 & -2 \\ 4 & 1 & 0 \\ 1 & 2 & 0 \end{bmatrix}$$

$$iii) A+B = \begin{bmatrix} 3 & -2 & 6 \\ 5 & -1 & 4 \\ 2 & 0 & 2 \end{bmatrix}$$

$$iv) B^T = \begin{bmatrix} 2 & 0 & 4 \\ 1 & -1 & 2 \\ -3 & -1 & 1 \end{bmatrix}$$

$$Q1 = \frac{12}{18}$$

$$\frac{12}{18}$$

$$2) \quad P = \begin{bmatrix} 2 \\ 4 \\ 6 \\ 1 \end{bmatrix} \quad T = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$T.P = 2+0+0+1 \\ 0+4+0+2 \\ 0+0+6+3 \\ 0+0+0+1$$

$$T.P = \begin{bmatrix} 3 \\ 6 \\ 9 \\ 1 \end{bmatrix}$$

Q25 6/6

$$3. \quad x' = x \cos A - y \sin A \\ y' = x \sin A + y \cos A \\ z' = z$$

$$3a. \quad \begin{bmatrix} x' \\ y' \\ z' \end{bmatrix} = \begin{bmatrix} x \cos A - y \sin A + 0z \\ x \sin A + y \cos A + 0z \\ 0x + 0y + 1z \end{bmatrix}$$

$$3b. \quad \begin{bmatrix} x' \\ y' \\ z' \end{bmatrix} = \begin{bmatrix} x \cos A + y \sin A + 0z \\ x \sin A - y \cos A + 0z \\ 0x + 0y - 1z \end{bmatrix}$$

$$3c. \quad x = 0.707, y = 1.414, z = 2, A = 45^\circ$$

$$x \cos A = 0.499244 \quad y \sin A = 0.999848$$

$$\rightarrow x \cos A - y \sin A = -0.49992^\circ$$

$$x \sin A = 0.49992^\circ$$

$$y \cos A = 0.99984^\circ$$

$$\rightarrow x \sin A + y \cos A = 1.49977^\circ$$

$$x' = -0.49992^\circ$$

$$y' = 1.49977^\circ$$

$$z' = 2$$

Q35 12/16

3a) $a = 2, 1, 3$ $b = 3, 2, -3$

$$a \times b = \begin{vmatrix} i & j & k \\ 2 & 1 & 3 \\ 3 & 2 & -3 \end{vmatrix}$$

$$+i \begin{vmatrix} 1 \times -3 \\ 2 \times 3 \end{vmatrix} - j \begin{vmatrix} 2 \times -3 \\ 3 \times 3 \end{vmatrix} + k \begin{vmatrix} 2 \times 2 \\ 3 \times 1 \end{vmatrix}$$

$$+i(-3-6) - j(-6-9) + k(4-3)$$

$$a \times b = \underline{-9, 15, 1}$$

4b) $a = 2, 1, 3$ $a \times b = -9, 15, 1$

$$|a| = \sqrt{2^2 + 1^2 + 3^2}$$

$$|a| = \sqrt{4 + 1 + 9}$$

$$|a| = \sqrt{14}$$

$$|a \times b| = \sqrt{-9^2 + 15^2 + 1^2}$$

$$|a \times b| = \sqrt{-81 + 225 + 1}$$

$$|a \times b| = \sqrt{145}$$

$$\theta = \cos^{-1} \left(\frac{\sqrt{14}}{\sqrt{145}} \right)$$

$$\theta = \underline{71.8969^\circ}$$

Q4 < 7/9

7/9

$$5) a = 3, 4, 0 \quad b = 8, 6, 0$$

$$a \cdot b = (3 \times 8) + (4 \times 6) + (0 \times 0)$$

$$a \cdot b = 24 + 24 + 0$$

$$a \cdot b = 48$$

$$|a| = \sqrt{3^2 + 4^2 + 0^2}$$

$$|a| = \sqrt{9 + 16 + 0}$$

$$|a| = \sqrt{25}$$

$$|a| = 5$$

$$|b| = \sqrt{8^2 + 6^2 + 0^2}$$

$$|b| = \sqrt{64 + 36 + 0}$$

$$|b| = \sqrt{100}$$

$$|b| = 10$$

$$\cos \theta = \frac{a \cdot b}{|a| |b|}$$

$$\theta = \cos^{-1} \left(\frac{48}{50} \right)$$

$$\theta = 16.2602^\circ$$

$$\cos \theta = \frac{48}{50}$$

$$\frac{48}{50}$$

$$a = 3, 2, 6$$

$$|a| = \sqrt{3^2 + 2^2 + 6^2}$$

$$|a| = \sqrt{9 + 4 + 36}$$

$$|a| = \sqrt{49}$$

$$|a| = 7$$

$$\hat{a} = \frac{a}{|a|}$$

$$\hat{a} = \left(\frac{3}{7}, \frac{2}{7}, \frac{6}{7} \right)$$

$$7) A = \begin{bmatrix} 1 & 1 & 6 \\ 1 & 2 & 2 \\ 1 & 3 & -1 \end{bmatrix}$$

$$|A| = +1 \begin{vmatrix} 2 & 2 \\ 3 & -1 \end{vmatrix} - 1 \begin{vmatrix} 1 & 2 \\ 1 & -1 \end{vmatrix} + 6 \begin{vmatrix} 1 & 2 \\ 1 & 3 \end{vmatrix}$$

$$|A| = +1 (2 \times -1 - 3 \times 2) - 1 (1 \times -1 - 1 \times 2) + 6 (1 \times 3 - 1 \times 2)$$

$$|A| = +1 (-2 - 6) - 1 (-1 - 2) + 6 (3 - 2)$$

$$|A| = -8 + 3 + 6$$

$$|A| = 1$$

$$8) \quad 1x + 1y + 6z = 1 \quad \textcircled{1}$$

$$1x + 2y + 2z = 2 \quad \textcircled{2}$$

$$1x + 3y - 1z = 4 \quad \textcircled{3}$$

$$\begin{matrix} A & X & K \\ \begin{bmatrix} x \\ y \\ z \end{bmatrix} & \begin{bmatrix} 1 & 1 & 6 \\ 1 & 2 & 2 \\ 1 & 3 & -1 \end{bmatrix} & = \begin{bmatrix} 1 \\ 2 \\ 4 \end{bmatrix} \end{matrix}$$

$$AX = K$$

$$X^{-1} = K$$

$$\textcircled{4} \quad 2x + 2y + 12z = 2$$

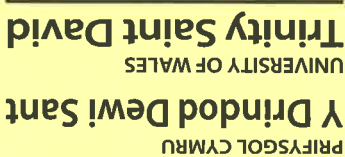
$$\textcircled{2} - \textcircled{4} \quad -1x + 0y + 10z = -1$$

12
9
085

$\frac{1}{9}$

TYNNWCH A
RHWYGWCH

AR GYFER DEFNYDD GWEINYDDOL YN UNIG, TYNNWCH Y STRIBYN TYLLOG I FFWRDD YN OFALUS



24 Tudalen

[illegible]

PLYGWCH

Cyfenw

(LLYTHRENNAU BREISION) Enw(au) cyntaf

A wneuch chi lenw'r rhan hon a'i SELIO cyn i'r arholiad ddechrau.