



Complete, fold and seal
(see note 2 below)

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Examination Answer Books

12 Pages

Instructions to Candidates

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. 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.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
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1	Student Number	1809251/1
2	Title of Examination Paper	Mathematics, Test 2
3	Module Code	M4X00391
4	Date and Time of Examination	10.05.19 P.m
5	Examination Venue	Hall
6	Seat Number	16
7	Number of Answer Books handed in	

List the numbers of the questions you have attempted	Office Use
Q2	
a	6
b	6
c	2
d	1
e	0
Q3	
a	20
b	2
c	0
d	1
Total	38/80

47.5%

Question Two :

i) $z_1 + z_2 =$

$$z = 2 + 3j + 5 - 2j = 7 + 1j \quad \checkmark \text{ ①}$$

ii) $z_1 - z_3 = 2 + 3j - 4 - j = -2 + 2j$

iii) $\bar{z}_1 + \bar{z}_3 =$

$$\bar{z}_1 = 2 - 3j \quad \bar{z}_3 = 4 - j$$

$$\bar{z}_1 + \bar{z}_3 = -2 - 2j \quad \times$$

iv) $\frac{z_1}{z_2} =$ $\times$

v) $(z_1)^2 + z_2 + z_3$

$$(2 + 3j)(2 + 3j) + 5 - 2j + 4 + j = \checkmark \text{ ①}$$

$$4 + 6j + 6j + 9j^2 + 5 - 2j + 4 + j = \checkmark \text{ ①}$$

$$4 + 12j - 9 + 5 - 2j + 4 + j =$$

$$= 4 + 9j \quad \text{①} \quad \times$$

123

$$b) \quad 14x^2 = -3x - 9$$

$$\# 14x^2 + 3x + 9 = 0 \quad \checkmark \quad \textcircled{1}$$

$$X = \frac{-3 \pm \sqrt{3^2 - 4(14)(9)}}{2(14)} \quad \checkmark \quad \textcircled{1}$$

$$\frac{-3 \pm \sqrt{-495}}{2(14)} \quad \checkmark \quad \textcircled{1}$$

$$\cancel{2 \pm 2} = \frac{-3 \pm 22.24j}{28} \text{ or } \frac{-3 \pm 22.24j}{28} \quad \checkmark \quad \textcircled{1}$$

$$\frac{-3}{28} + \frac{22.24j}{28} \quad \checkmark \quad \textcircled{1} \quad \text{or} \quad \frac{-3}{28} - \frac{22.24j}{28} \quad \checkmark \quad \textcircled{1}$$

$$r = \sqrt{\quad}$$

?

$$c) (6 + 5j)^5 = r^n (\cos n\theta + j \sin n\theta)$$

$$r = \sqrt{6^2 + 5^2}$$

$$r = \sqrt{61}$$

$$r = 7.81 \quad \checkmark \quad \textcircled{1}$$

$$\tan^{-1}(7.81) = 82.70 \quad \times$$

$$\theta = 82.70 \quad \times$$

$$\begin{aligned} \text{so } &= 7.81^5 (\cos 5(82.70) + \textcircled{5j} \sin 5(82.70)) \\ &= 2393893.938 + \textcircled{36.03j} \end{aligned}$$

$$(-2 + 3j)^7$$

$$r = \sqrt{2^2 + 3^2}$$

$$= \sqrt{13} = 3.60 \quad \checkmark \quad \textcircled{1}$$

~~$$r = 3.60$$~~

$$\tan^{-1}(3.60) = 74.47 \quad \times$$

$$\theta = 180 - 74.47 \quad \times$$

$$\theta = 105.53 \quad \times$$

$$\begin{aligned} &3.60^7 (\cos 7 \times 105.53 + \textcircled{3j} \sin 7 \times 105.53) \\ &7422.29 + 7541 \end{aligned}$$

$$= 14963.53 \quad \times$$



$$d) - 1 - 8j \quad \checkmark \quad \textcircled{1}$$

$$e) \quad z_1 z_2 z_3$$

$$z_1 = 6 + j \quad z_2 = 2 - 5j \quad z_3 = 1 - j$$

$$(6 + j)(2 - 5j)(1 - j)$$

$$= (12 - 5j)(1 - j) \quad \times$$

$$z_1 z_2 z_3 = 12 + 5j \quad \times$$

$$r = \sqrt{12^2 + 5^2}$$

$$r = \sqrt{169} = r = 13 \quad \times$$

$$\tan^{-1}(13) = 85.60$$

$$\theta = 85.60 \quad \times$$

$$\frac{5}{85.60} = \quad \times$$

Question Three:

$$i) \begin{matrix} AB \\ A: \end{matrix} \begin{bmatrix} 5 & -1 & 6 \\ 7 & 5 & -1 \\ 1 & 0 & 2 \end{bmatrix} \times B = \begin{bmatrix} 3 & 1 & 1 \\ 2 & -5 & 4 \\ -3 & 1 & 1 \end{bmatrix}$$

$$(5 \times 3) + (-1 \times 2) + (6 \times -3) = -5 \checkmark$$

$$(5 \times 1) + (-1 \times -5) + (6 \times 1) = 16 \checkmark$$

$$(5 \times 1) + (-1 \times 4) + (6 \times 1) = 7 \checkmark$$

~~$$AB = \begin{bmatrix} 18 & 4 & 3 \end{bmatrix}$$~~

$$AB = \begin{bmatrix} -5 & 16 & 7 \\ 34 & -19 & 26 \\ -3 & 3 & 3 \end{bmatrix}$$

$$(7 \times 3) + (5 \times 2) + (-1 \times -3) = 34 \checkmark$$

$$(7 \times 1) + (5 \times -5) + (-1 \times 1) = -19 \checkmark$$

$$(7 \times 1) + (5 \times 4) + (-1 \times 1) = 26 \checkmark$$

$$(1 \times 3) + (0 \times 2) + (2 \times -3) = -3 \checkmark$$

$$(1 \times 1) + (0 \times -5) + (2 \times 1) = 3 \checkmark$$

$$(1 \times 1) + (0 \times 1) + (2 \times 1) = 3 \checkmark$$

$$ii) BA = \begin{bmatrix} 3 & 1 & 1 \\ 2 & -5 & 4 \\ -3 & 1 & 1 \end{bmatrix} \times \begin{bmatrix} 5 & -1 & 6 \\ 7 & 5 & -1 \\ 1 & 6 & 2 \end{bmatrix}$$

$$(3 \times 5) + (1 \times 7) + (1 \times 1) = 23 \checkmark$$

$$(3 \times -1) + (1 \times 5) + (1 \times 6) = 2 \checkmark$$

$$(3 \times 6) + (1 \times -1) + (1 \times 2) = 19 \checkmark$$

$$(2 \times 5) + (-5 \times 7) + (4 \times 1) = -21 \checkmark$$

$$(2 \times -1) + (-5 \times 5) + (4 \times 6) = -27 \checkmark$$

$$(2 \times 6) + (-5 \times -1) + (4 \times 2) = 25 \checkmark$$

$$(-3 \times 5) + (1 \times 7) + (1 \times 1) = -7 \checkmark$$

$$(-3 \times -1) + (1 \times 5) + (1 \times 6) = 8 \checkmark$$

$$(-3 \times 6) + (1 \times -1) + (1 \times 2) = -17 \checkmark$$

$$BA = \begin{bmatrix} 23 & 2 & 19 \\ -21 & -27 & 25 \\ -7 & 8 & -17 \end{bmatrix}$$

5

5

~~ii) AC = can't calculate it.~~ ~~3x3 2x3~~

iii) CA = ^① can't calculate it. $C = \begin{bmatrix} 6 & 5 \\ 4 & 3 \\ 2 & 1 \end{bmatrix} \times A = \begin{bmatrix} 5 & -1 & 6 \\ 7 & 5 & -1 \\ 1 & 0 & 2 \end{bmatrix}$

iii) AC = $\begin{bmatrix} 5 & -1 & 6 \\ 7 & 5 & -1 \\ 1 & 0 & 2 \end{bmatrix} \begin{bmatrix} 6 & 5 \\ 4 & 3 \\ 2 & 1 \end{bmatrix}$
 $(3 \times 3) \quad (3 \times 2)$

$$(5 \times 6) + (-1 \times 4) + (6 \times 2) =$$

$$(5 \times 5) + (-1 \times 3) + (6 \times 1) =$$

$$(7 \times 6) + (5 \times 4) + (-1 \times 2) = 60$$

$$(7 \times 5) + (5 \times 3) + (-1 \times 1) = 49$$

$$(1 \times 6) + (0 \times 4) + (2 \times 2) =$$

$$(1 \times 5) + (0 \times 3) + (2 \times 1) =$$

$$AC = \begin{bmatrix} 38 & 28 \\ 60 & 49 \\ 10 & 7 \end{bmatrix}$$

v) |A|

$$\begin{vmatrix} 5 & -1 & 6 \\ 7 & 5 & 2 \\ 1 & 0 & 2 \end{vmatrix} \begin{vmatrix} 5 & -1 \\ 7 & 5 \\ 1 & 0 \end{vmatrix}$$

$$(5 \times 5 \times 2) + (-1 \times -1 \times 1) + (6 \times 7 \times 0) = 51$$

$$(1 \times 5 \times 6) + (0 \times -1 \times 5) + (2 \times 7 \times -1) = 16$$

$$(51) - (16) = 35$$

|B|

$$\begin{vmatrix} 3 & 1 & 3 \\ 2 & 5 & 2 \\ -3 & -1 & 1 \end{vmatrix} \begin{vmatrix} 3 & 1 \\ 2 & -5 \\ 1 & 1 \end{vmatrix}$$

$$(3 \times -5 \times 1) + (1 \times 4 \times -3) + (1 \times 2 \times 1) = -25$$

$$(-3 \times -5 \times 1) + (1 \times 4 \times 3) + (1 \times 2 \times 1) = 29$$

$$(-25) - (29) = -54$$

vii) $A+B=$

$$\begin{bmatrix} 5 & -1 & 6 \\ 7 & 5 & -1 \\ 1 & 0 & 2 \end{bmatrix} + \begin{bmatrix} 3 & 1 & 1 \\ 2 & -5 & 4 \\ -3 & 1 & 1 \end{bmatrix}$$

$$A+B = \begin{bmatrix} 8 & 0 & 7 \\ 9 & 0 & 3 \\ -2 & 1 & 3 \end{bmatrix} \quad \text{✓ ①}$$

$A+D =$ can't calculate it (not possible)

① ✓

b) $9x^2 + 3x = 7$ ✓ ①
 $9x^2 + 3x - 7 = 0$ ✓ ②

$$x = \frac{-3 \pm \sqrt{3^2 - 4(9)(-7)}}{2(9)}$$

$$4.7961 \pm 2.19$$

$$2(9)$$

$$1.06 \text{ or } 0.73$$

$$x = 10.6$$

or

$$x = 1$$

$$x = 0.73$$

$$9 \times 0.73^2 + 3 \times 0.219 = 7: \text{it is true.}$$

C=

26

$$\begin{aligned}
 d) \quad 5 + 3 + 1 &= x = 25 \\
 3 - 2 + 3 &= y = 26 \\
 2 + 1 - 5 &= z = -6
 \end{aligned}$$

$$A = \begin{bmatrix} 5 & 3 & 1 \\ 3 & -2 & 3 \\ 2 & 1 & 5 \end{bmatrix} \begin{matrix} x \\ y \\ z \end{matrix} = \begin{bmatrix} 25 \\ 26 \\ -6 \end{bmatrix}$$

$$= \quad \textcircled{A = 315} \quad \times$$

$$A' = \begin{bmatrix} 25 & 3 & 1 \\ 26 & -2 & 3 \\ -6 & 1 & 5 \end{bmatrix} \begin{bmatrix} 25 & 3 \\ 26 & -2 \\ -6 & 1 \end{bmatrix}$$

$$(25 \times -2 \times 5) + (3 \times 3 \times -6) + (1 \times 26 \times 1) = -78$$

$$(-6 \times -2 \times 1) + (1 \times 3 \times 25) + (5 \times 26 \times 3) = +477$$

$$-78 - 477 = -555 \quad \times$$

$$A'' = \begin{bmatrix} 3 & 25 & 1 \\ 3 & 26 & 3 \\ 2 & -6 & 5 \end{bmatrix} \begin{bmatrix} 5 & 25 \\ 3 & 26 \\ 2 & -6 \end{bmatrix}$$

$$(5 \times 26 \times 5) + (25 \times 3 \times 2) + (1 \times 3 \times -6) = 782$$

$$(2 \times 26 \times 1) + (-6 \times 3 \times 5) + (5 \times 3 \times 25) = 337$$

$$782 - 337 = 445 \quad \times$$

$$A''' = \begin{bmatrix} 5 & 3 & 25 \\ 3 & -2 & 26 \\ 2 & 1 & -6 \end{bmatrix} \begin{bmatrix} 5 & 3 \\ 3 & -2 \\ 2 & 1 \end{bmatrix}$$

$$(5 \times -2 \times 6) + (3 \times 26 \times 2) + (25 \times 3 \times 1) = 291$$

$$(2 \times -2 \times 25) + (1 \times 26 \times 5) + (-6 \times 3 \times 3) = -24$$

$$291 - (-24) = 315$$

$$\frac{A'}{A} = x$$

$$\frac{A''}{A} = y$$

$$\frac{A'''}{A} = z$$

$$x = \frac{-555}{315}$$

$$y = \frac{445}{315}$$

$$z = \frac{315}{315}$$

$$x = 1.76$$

$$y = 1.4$$

$$z = 1$$

x

x

x