

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.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

Complete, fold and seal
(see note 2 below)

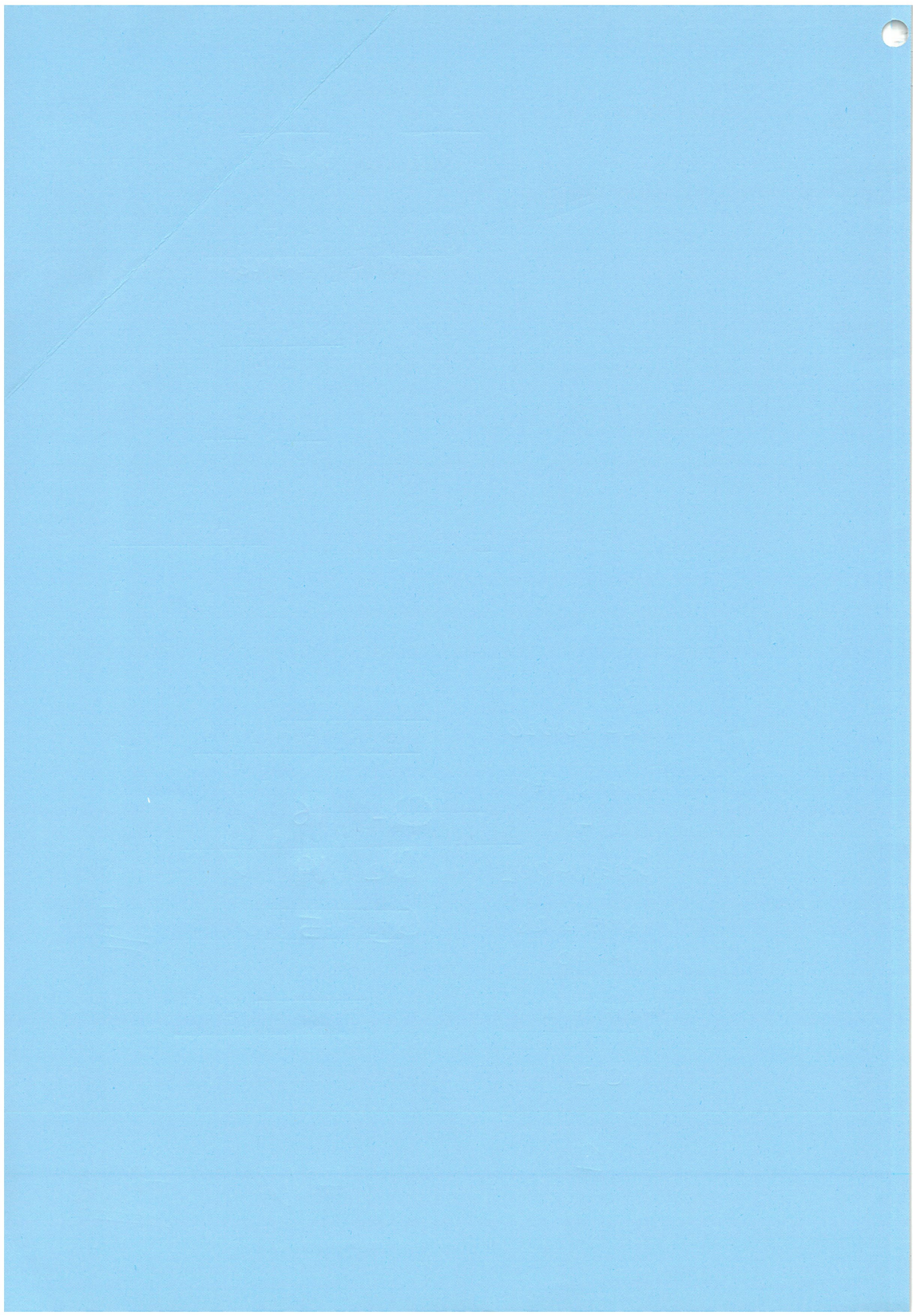
SURNAME: VALE

FORENAME(S): BRADLEIGH MORGAN

1	Student Number	VAL21861026
2	Title of Examination Paper	MATHS TEST 2
3	Module Code	GOEN4001
4	Date and Time of Examination	18/05/2026 14:00
5	Examination Venue	MAIN MALL
6	Seat Number	C 2
7	Number of Answer Books handed in	1

[illegible]

40 % ✓



Q1

$$\textcircled{A} \textcircled{1} z_1 + z_2 = (3 + 7j) + (4 + 5j)$$

$$= 7 + 12j$$

Q116/33

$$\textcircled{2} z_2 + 3z_3 = (4 + 5j) + (6 + 18j)$$

$$= 10 + 23j$$

Q1a10/18

$$\textcircled{3} z_2^2 + z_3 = (4 + 5j)(4 + 5j) + (2 + 6j)$$

$$= (16 + 20j + 20j + 25) + (2 + 6j)$$

$$= (41 + 40j) + (2 + 6j)$$

$$= 43 + 46j$$

$$\textcircled{4} z_1 z_2 z_3 = (3 + 7j)(4 + 5j) + (2 + 6j)$$

$$= (12 + 15j + 28j + 35) + (2 + 6j)$$

$$= (47 + 43j)(2 + 6j)$$

$$= (94 + 282j + 86j + 258)$$

$$= 352 + 368j$$

E.C.F

x E.C.F

$$(5) \frac{z_1}{z_2} = \frac{3+7j}{4+5j} \times \frac{4-5j}{4-5j}$$

$$= \frac{(12 - 15j + 28j - 35)}{16 + 25}$$

$$= \frac{-23 + 13j}{41}$$

$$= \frac{-23}{41} + \frac{13}{41}j$$

$$(6) \frac{z_1^2 - z_2^2}{z_1^2 - z_1 z_2} = 2z_1^2 - z_1 z_2^2 \quad \times \underline{0}$$

$$(8) 2x^2 - 6x + 9 = 0$$

$$a = 2$$

$$b = -6$$

$$c = 9$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(2)(9)}}{2(2)}$$

$$x = \frac{6 \pm \sqrt{36 - 72}}{4}$$

$$x = \frac{6 \pm \sqrt{-36}}{4}$$

$$x = \frac{6 - \sqrt{-36}}{4}$$

$$x = 3$$

$$x = 0$$

Q11

1/9

$$x^2 = 2(3)^2 - 6(3) + 9 = 0$$

$$\text{or } = 2(0)^2 - 6(0) + 9 = 0$$

$$\textcircled{C} (5 + 3j)^6$$

$$[r \angle \theta]^n = r^n \angle n\theta = r^n (\cos n\theta + j \sin n\theta)$$

$$r = |z| = \sqrt{a^2 + b^2}$$

$$r = |z| = \sqrt{5^2 + 3^2}$$

$$r = 5.83$$

$$\theta = 30.9^\circ$$

~~$$z = 5.83 \angle 30.9^\circ$$~~

$$\theta = \tan^{-1}\left(\frac{3}{5}\right) = 30.9^\circ$$

$$z = 5.83 \angle 30.9^\circ$$

F

$$\theta = \tan^{-1}\left(\frac{-3}{5}\right) = -30.9^\circ$$

$$\theta = 360^\circ - 30.9 = 329.1$$

~~Showing workings~~

$$Z = 5.83^6 (\cos(6 \times 30.9) + j \sin(6 \times 30.9))$$

$$Z = 39265 (\cos(185.4) + j \sin(185.4))$$

$$= -39090 - 3695j$$

Q1c
5/6

Q2.

A

①

$$A = \begin{bmatrix} 1 & 3 & 3 \\ 0 & 5 & 4 \\ 5 & 2 & 6 \end{bmatrix} \begin{bmatrix} 1 & 3 \\ 0 & 5 \\ 5 & 2 \end{bmatrix}$$

$75 + 8 + 0 = 83$
 $30 + 60 + 0 = 90$

$$= 90 - 83 = 7$$

$$A = 7$$

②

$$C = \begin{bmatrix} 5 & 4 \\ -2 & 6 \end{bmatrix} \begin{matrix} -8 \\ 30 \end{matrix} = 30 + 8 = 38$$

$$C = 38$$

$$\textcircled{3} \quad AB = \begin{bmatrix} 1 & 3 & 3 \\ 0 & 5 & 4 \\ 5 & 2 & 6 \end{bmatrix} \begin{bmatrix} 3 & 5 \\ 2 & -2 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 12 & 2 \\ 14 & -6 \\ 25 & 27 \end{bmatrix}$$

show workings

$$\textcircled{4} \quad AD = \begin{bmatrix} 1 & 3 & 3 \\ 0 & 5 & 4 \\ 5 & 2 & 6 \end{bmatrix} \begin{bmatrix} 0 & 2 & 2 \\ 3 & 5 & 1 \\ 5 & 1 & 4 \end{bmatrix} = \begin{bmatrix} 24 & 20 & 17 \\ 35 & 29 & 21 \\ 36 & 26 & 36 \end{bmatrix}$$

show workings

$$\textcircled{5} \quad CD = \begin{bmatrix} 5 & 4 \\ -2 & 6 \end{bmatrix} \begin{bmatrix} 0 & 2 & 2 \\ 3 & 5 & 1 \\ 5 & 1 & 4 \end{bmatrix} = \text{NOT POSSIBLE}$$

Q2

19/33

Q2a

5/17

⑥

$$W = \begin{bmatrix} x & 3 & -4 \\ 4 & 4 & 2 \\ -2 & 5 & (x+2) \end{bmatrix} \begin{bmatrix} x & 3 \\ 4 & 4 \\ -2 & 5 \end{bmatrix} = \begin{bmatrix} ? \\ . \\ ? \end{bmatrix}$$

⑧

$$A = \begin{bmatrix} 6 & 3 & 1 \\ 2 & 0 & 5 \\ 4 & 2 & 3 \end{bmatrix}$$

$$A^{-1} = \frac{\text{adj } A}{|A|}$$

Q2b

8/10

$$0 + 60 + 18 = 78$$

$$|A| = \begin{bmatrix} 6 & 3 & 1 \\ 2 & 0 & 5 \\ 4 & 2 & 3 \end{bmatrix} \begin{bmatrix} 6 & 3 \\ 2 & 0 \\ 4 & 2 \end{bmatrix}$$

$$|A| = 64 - 78 = -14$$

$$0 + 60 + 4 = 64$$

MINORS

$$1) (0 \times 3) - (5 \times 2) = -10 \checkmark$$

$$2) (2 \times 3) - (5 \times 4) = -14 \checkmark$$

$$3) (2 \times 2) - (0 \times 4) = 4 \checkmark$$

$$4) (3 \times 3) - (1 \times 2) = 7 \checkmark$$

$$5) (6 \times 3) - (1 \times 4) = 14 \checkmark$$

$$6) (6 \times 2) - (3 \times 4) = 0 \checkmark$$

$$7) (5 \times 3) - (0 \times 1) = 15 \checkmark$$

$$8) (6 \times 5) - (1 \times 2) = 28 \checkmark$$

$$9) (6 \times 0) - (3 \times 2) = -6 \checkmark$$

$$= \begin{bmatrix} -10 & -14 & 4 \\ 7 & 14 & 0 \\ 15 & 28 & -6 \end{bmatrix}$$

$$= \begin{bmatrix} -10 & -14 & 4 \\ 7 & 14 & 0 \\ 15 & 28 & -6 \end{bmatrix} \rightarrow \begin{bmatrix} + & - & + \\ - & + & - \\ + & - & + \end{bmatrix} \rightarrow \begin{bmatrix} -10 & 14 & 4 \\ -7 & 14 & 0 \\ 15 & -28 & -6 \end{bmatrix}$$

$$\textcircled{B} \quad A = \frac{-1}{-14} \begin{bmatrix} -10 & 14 & 4 \\ -7 & 14 & 0 \\ 15 & -28 & -6 \end{bmatrix}$$

$$\textcircled{C} \quad \begin{aligned} 2x - y - 2z &= -2 \\ -x + y + z &= 0 \\ x - 2y + z &= 8 \end{aligned}$$

Q2c

6/6

$$= \begin{bmatrix} 2 & -1 & -2 \\ -1 & 1 & 1 \\ 1 & -2 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -2 \\ 0 \\ 8 \end{bmatrix}$$

$$\Delta = \begin{bmatrix} 2 & -1 & -2 \\ -1 & 1 & 1 \\ 1 & -2 & 1 \end{bmatrix} \begin{bmatrix} 2 & -1 \\ -1 & 1 \\ 1 & -2 \end{bmatrix} = (-3) - (-3) = 2$$

$-2 + -4 + 1 = -5$
 $2 + -1 + -4 = -3$

$$\Delta x = \begin{bmatrix} -2 & -1 & -2 \\ 0 & 1 & 1 \\ 8 & -2 & 1 \end{bmatrix} \begin{bmatrix} -2 & -1 \\ 0 & 1 \\ 8 & -2 \end{bmatrix} = (-10) - (-12) = 2$$

$-16 + 4 + 0 = -12$
 $-2 + -8 + 0 = -10$

$$\Delta y = \begin{bmatrix} 2 & -2 & -2 \\ -1 & 0 & 1 \\ 1 & 8 & 1 \end{bmatrix} \begin{bmatrix} 2 & -2 \\ -1 & 0 \\ 1 & 8 \end{bmatrix} = (14) - (18) = -4$$

$0 + -2 + 16 = 14$

$$y = -4$$

$$\begin{aligned}
 & \textcircled{C} \Delta Z = \begin{bmatrix} 2 & -1 & -2 \\ -1 & 1 & 0 \\ 1 & -2 & 8 \end{bmatrix} \begin{bmatrix} 2 & -1 \\ -1 & 1 \\ 1 & -2 \end{bmatrix} = (12) - (6) = 6 \\
 & \quad \quad \quad -2 + 0 + 8 = 6 \\
 & \quad \quad \quad 16 + 0 + -4 = 12 \\
 & \quad \quad \quad \underline{\underline{Z = 6}}
 \end{aligned}$$

$$x = \frac{2}{2} \quad y = \frac{2}{2} \frac{-4}{2} \quad z = \frac{6}{2}$$

$$x = 1 \quad y = -2 \quad z = 2$$

1

Q3.

(A)

(1)

$$\int x(2x^3 + 3x^2 + -3x + 5) dx$$

$$= \int x \left(\frac{2x^4}{4} + \frac{3x^3}{3} - \frac{3x^2}{2} + 5x \right) + C$$

$$(2) \int (\sin 3x + \cos 5x + (3x + 1)(4x + 3)) dx$$

$$= \int \left(-\frac{1}{3} \cos 3x + \frac{1}{5} \sin 5x + 12x^2 + 9x + 4x + 3 \right) + C$$

$$= \int \left(-\frac{1}{3} \cos 3x + \frac{1}{5} \sin 5x + \frac{12x^3}{3} + \frac{13x^3}{3} + 3 \right) + C$$

$$(3) \int_0^3 (4x^3 + 3x^2 + 2x - 3) dx$$

$$= \int_0^3 \left[\frac{4x^4}{4} + \frac{3x^3}{3} + \frac{2x^2}{2} - 3x \right] + C$$

$$= \int_0^3 \left[\frac{4(3)^4}{4} + \frac{3(4)^3}{3} + \frac{2(4)^2}{2} - 3(4) \right] + C = 149$$

$$- \int_0^3 \left[\frac{4(0)^4}{4} + \frac{3(0)^3}{3} + \frac{2(0)^2}{2} - 3(0) \right] + C = 0$$

$$= \left[\frac{4(81)}{4} + \frac{3(64)}{3} + \frac{2(16)}{2} - 12 \right] + C$$

Q35/34Q3a5/20

$$= \left[\frac{324}{4} + \frac{192}{3} + \frac{32}{2} - 12 \right]_0^2 = 149$$

$\uparrow$ E.C.F

$$= 149 - 0 = 149 \quad \text{E.C.F}$$

$$\textcircled{4} \int_1^2 (e^{2x} + 2x^3 + 7) dx$$

$$= 2 \left[\frac{1}{2} e^{2x} + \frac{2x^4}{4} + 7x \right]_1^2 + C$$

$$= 2 \left[\frac{1}{2} e^{2(2)} + \frac{2(2)^4}{4} + 7(2) \right] + C$$

$$- \left[\frac{1}{2} e^{2(1)} + \frac{2(1)^4}{4} + 7(1) \right] + C = ?$$

$$\textcircled{5} \int_1^4 (\sqrt{x} - 3)(\sqrt{x} + 5) dx$$

$$= \int_1^4 (\sqrt{4} - 3)(\sqrt{4} + 5) + 5(4) + C$$

$$= \int_1^4 (-1)(7) + 20 + C$$

$$= 13$$

$$= \int_1^4 (\sqrt{1} - 3)(\sqrt{1} + 5) + 5(1) + C$$

$$= \int_1^4 (-2)(6) + 5 + C = -7 = 13 - (-7) = 20$$

(6)

$$\int_0^2 \frac{x+1}{x^2+3x+2} dx$$

$$= \int_0^2 \left[\frac{\frac{x^2}{2} + 1}{\frac{2x^3}{3} + \frac{3x^2}{2} + 2} \right] + C$$

$$= \int_0^2 \left[\frac{\frac{(2)^2}{2} + 1}{\frac{2(2)^3}{3} + \frac{3(2)^2}{2} + 2} \right] + C = \frac{3}{13.3}$$

$$= 0.22$$

$$= \int_0^2 \left[\frac{\frac{(0)^2}{2} + 1}{\frac{2(0)^3}{3} + \frac{3(0)^2}{2} + 2} \right] + C = \frac{0}{2}$$

$$= 0.22$$

$$= 0.22 - 0 = 0.22$$

⑧

$$\int x(4x^2 - 5)^3 dx \quad (\text{let } u = 4x^2 - 5)$$

Q3b

?

0/6Q3c0/8

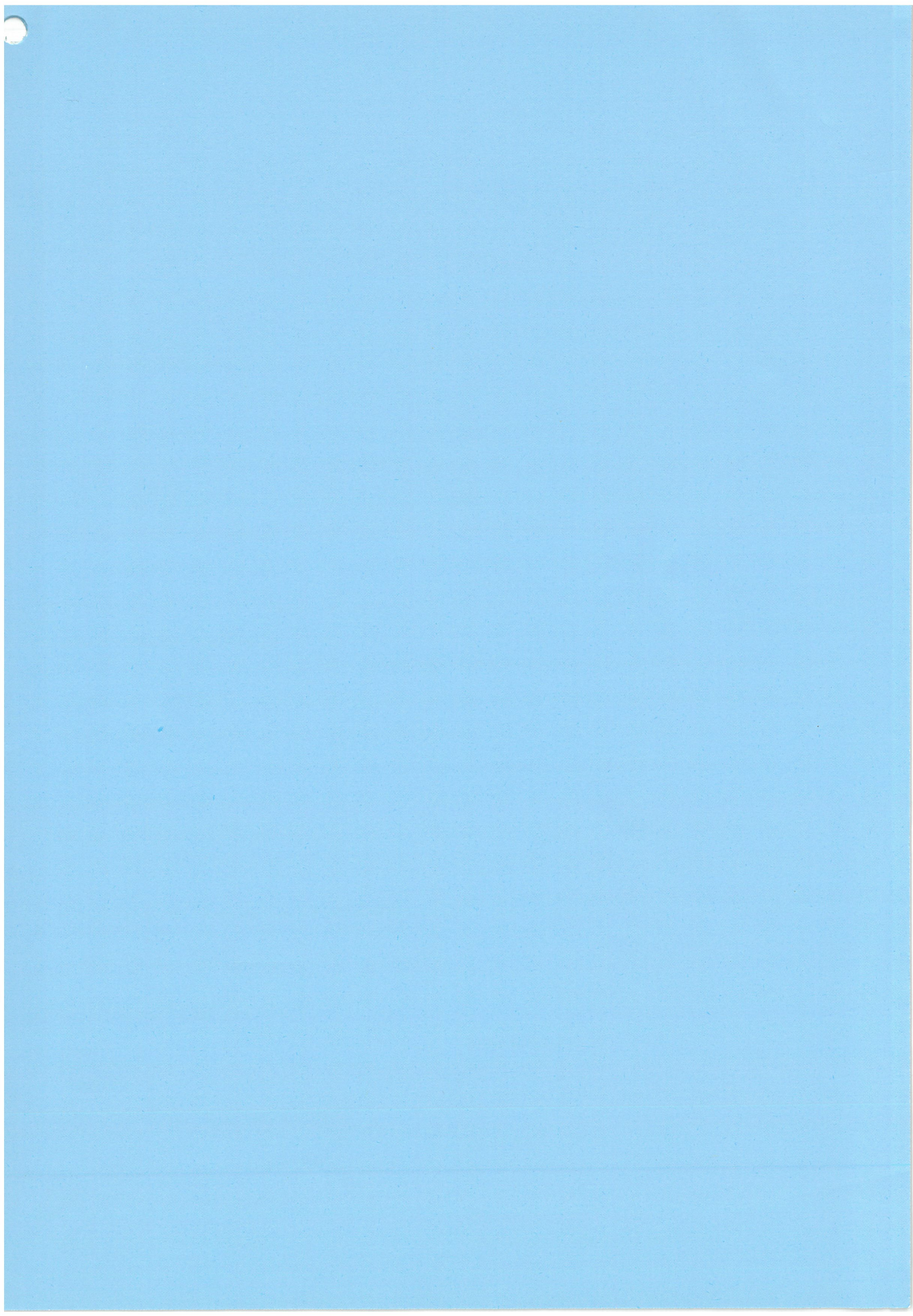


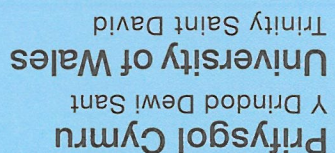
Question No.

Examiner Only

Rhif y Cwestiwn

Arholwr yn unig





12 Tudalen

1. Rhwch yr holl wybodaeth y gofynnir amdani yn y blychau isod.

2. Rhwch eich enw yn lle a ddarparwyd ar y dde, plygwch et a'i selio i lawr (gan ddefnyddio'r label a ddarparwyd) i guddio'ch enw.

3. Rhaid i'r atebion fod mewn llawysgrifen ddarllenadwy. Gall yr Arholwyr nallu ai anwybyddu sgrïpt annarllenedadwy, neu drefnu iddi gael ei theipio a chael yr ymgeisydd i dalu.

4. Ysgriennwch eich atebion mewn linc.

5. Dechreuwch bob ateb ar dudalen newydd. Gwnewch unrhyw fras nodiadau yn y llyfr atebion a thynnu llinell drwyddynt.

6. Ni ddylid rhwgo unrhyw ran o'r llyfr hwn; rhaid ei gyflwyno yn gyfan.

7. Os defnyddir mwy nag un llyfr, rhwymwch hwy gyda'i gilydd gan ddefnyddio'r tagiau sydd ar gael oddi wrth y gwyllwtr/gwylwyr.

8. Rhaid dychwelyd pob llyfr. Ni chanaiteir mynd â llyfrau atebion, wedi eu defnyddio neu heb eu defnyddio, allan o'r lleoliad arholi o dan unrhyw amgylchiadau.

7	Nifer y Llyfrau Atebion a gyflwynwyd	
6	Rhif Sedd	
5	Lleoliad yr Arholiad	
4	Dyddiad ac Amser yr Arholiad	
3	Cod y Modwl	
2	Teitl y Papur Arholiad	
1	Rhif Myfyrwr	

[illegible]

(See the other side for English version)

Llenwch, plygwrch a seliwrch
(gweler nodyn 2 isod)

CYFENN:

ENW(AU) CYNTAF:

ENW(AU) CYNTAF: