



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)

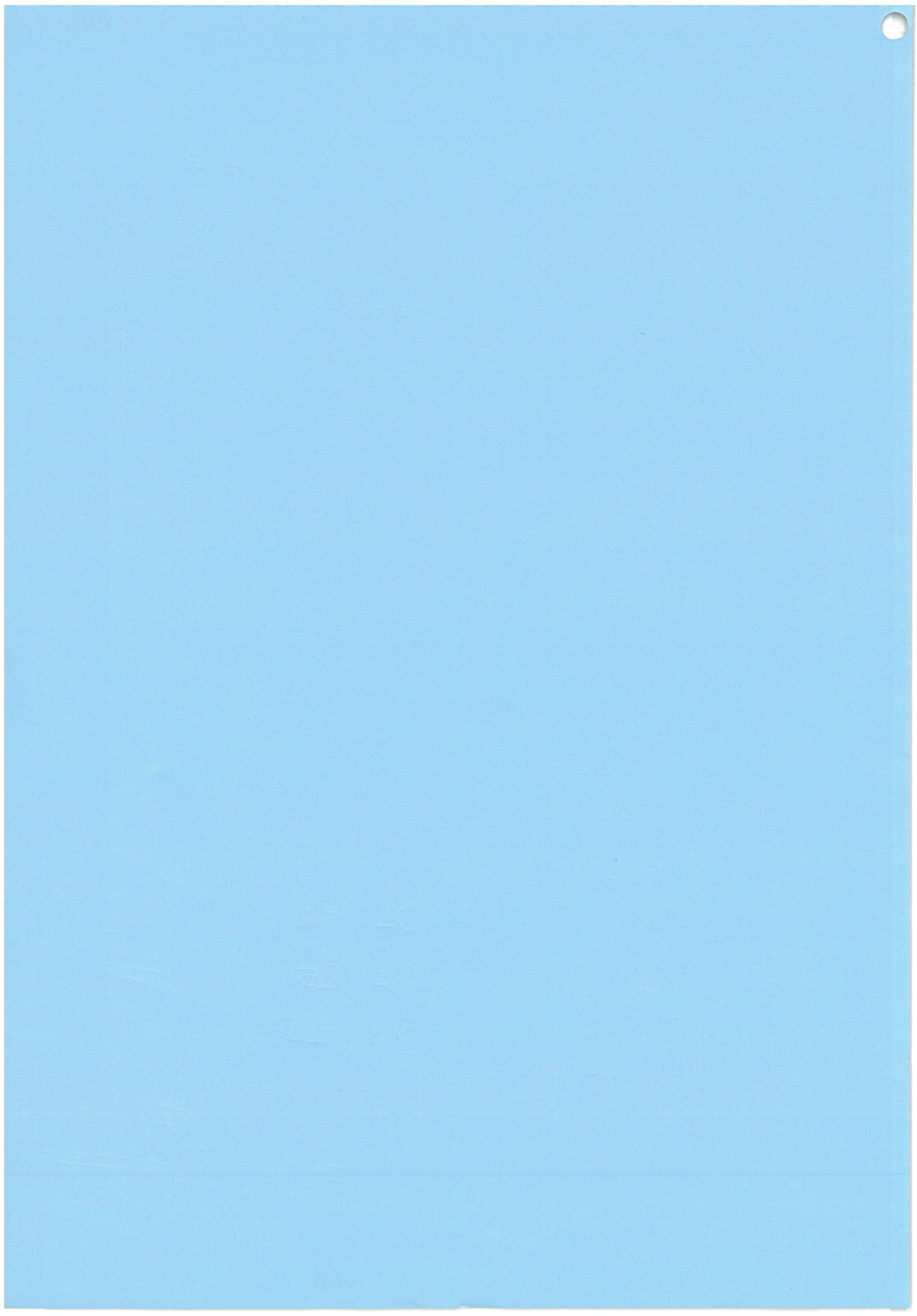
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Babiker

1	Student Number	M041984852
2	Title of Examination Paper	Mathematic Test 1
3	Module Code	GOEN4001
4	Date and Time of Examination	19.01.2026
5	Examination Venue	Flower College
6	Seat Number	C4
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
1	
2	
3	
Q1	32✓
Q2	25✓
Q3	22✓
Total	79/100



Q1

Q1

$$(i) y = 2x^6 - 5x^3 + 4x - 9$$

$$\frac{dy}{dx} = 12x^5 - 15x^2 + 4$$

2

32/35

$$(ii) y = \frac{4}{x^{\frac{1}{2}}} - 5\sqrt{x} + \frac{3}{e^2}$$

$$y = 4x^{-\frac{1}{2}} - 5x^{\frac{1}{2}} + 3e^{-2}$$

$$\frac{dy}{dx} = -2x^{-\frac{3}{2}} - \frac{1}{2}x^{-\frac{1}{2}} - 6e^{-2}$$

2

Q1a

19/22

$$(iii) y = 4\sin(4x) - 2\cos(5x) + 3\tan\left(\frac{x}{3}\right)$$

$$\frac{dy}{dx} = 16\cos(4x) + 10\sin(5x) + \sec^2\left(\frac{x}{3}\right)$$

2

$$(iv) y = 5x^4 e^{2x}$$

$$\text{let } u = 5x^4 \quad \frac{du}{dx} = 20x^3$$

$$\text{let } v = e^{2x}$$

$$\frac{dv}{dx} = 2e^{2x}$$

4

$$\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$$

$$\frac{dy}{dx} = 5x^4(2e^{2x}) + e^{2x}(20x^3)$$

$$\frac{dy}{dx} = 10x^4 e^{2x} + 20x^3 e^{2x}$$

$$(v) y = \frac{3\cos(3x)}{e^x + 5}$$

$$\text{let } u = 3\cos(3x) \quad \frac{du}{dx} = -9\cos(3x)$$

$$\text{let } v = e^x + 5$$

$$\frac{dv}{dx} = e^x$$

$$\frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

$$\frac{dy}{dx} = \frac{(e^x + 5)(-9\cos(3x)) - 3\cos(3x)e^x}{(e^x + 5)^2}$$

$$\frac{dy}{dx} = \frac{-9e^x \cos(3x) - 45\cos(3x) - 3e^x \cos(3x)}{(e^x + 5)(e^x + 5)}$$

$$(vi) y = \frac{2}{7}(3x^4 + 4x)^3$$

$$\frac{dy}{dx} = \frac{6}{7}(3x^4 + 4x)^2(12x^3 + 4)$$

3

(vii) $y = \frac{1}{5} \sqrt[5]{5x^4 + \sin(2x)}$ $y = \frac{1}{5} (5x^4 + \sin(2x))^{\frac{1}{5}}$

$$\frac{dy}{dx} = \frac{1}{25} (5x^4 + \sin(2x))^{-\frac{4}{5}} \cdot (20x^3 + 2\cos(2x))$$

(b) $w = 3x^4y^3 + 5x^2 + 6y^2 + e^{2x} - \cos(3y)$

$$\frac{dw}{dx} = 12x^3y^3 + 10x + 2e^{2x}$$

$$\frac{d^2w}{dx^2} = 24x^2y^3 + 10 + 4e^{2x}$$

$$\frac{d^2w}{dydx} = 36x^3y^2$$

$$\frac{dw}{dy} = 9x^4y^2 + 12y + 3\sin(3y)$$

$$\frac{d^2w}{dy^2} = 18x^4y + 12 + 9\cos(3y)$$

$$\frac{d^2w}{dxdy} = 36x^3y^2$$

(c) 1A $y = 3e^x + x^2$

$$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 2x^2 - 6x + 12$$

$$\frac{dy}{dx} = 3e^x + 2x \quad , \quad \frac{d^2y}{dx^2} = 3e^x + 2$$

$$(3e^x + 2) - 3(3e^x + 2x) + 2(3e^x + x^2) = 2x^2 - 6x + 12$$

$$3e^x + 2 - 9e^x - 6x + 6e^x + 2x^2 = 2x^2 - 6x + 12$$

$$2 - 6x + 2x^2 = 2x^2 - 6x + 12$$

$$2x^2 - 6x + 2 = 2x^2 - 6x + 12$$

$$\text{LHS} = \text{RHS}$$

(d) Find

$$y = x \sin(x)$$

$$\frac{dy}{dx} = x \cdot \cos(x) + \sin(x)$$

$$\frac{d^2y}{dx^2} = x \cdot -\sin(x) + \cos(x) + \cos(x)$$

Q1b

6/6

Q1c

4/4

Q1d

3/3

$$\frac{d^3y}{dx^3} = x \cdot (-\cos(x)) + \sin(x) - \sin(x) - \sin(x)$$

Q2

Q2

25/33

Q2 Express $\frac{5x+7}{(x+1)(x-3)}$

$$\left\{ \frac{5x+7}{(x+1)(x-3)} = \frac{A}{(x+1)} + \frac{B}{(x-3)} \right\} (x+1)(x-3)$$

$$5x+7 = A(x-3) + B(x+1)$$

$$\text{let } x = 3$$

$$15+7 = 0 + 4B$$

$$23 = 4B \quad B = 5.75$$

$$\text{let } x = -1$$

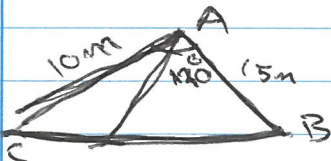
$$-5+7 = A(-4)$$

$$2 = -4A$$

$$A = -0.5$$

$$\frac{5x+7}{(x+1)(x-3)} = \frac{-0.5}{(x+1)} + \frac{5.75}{(x-3)} \text{ E.C.F.}$$

Q2b



Q2c

$$AB = \sqrt{AC^2 + AB^2 - 2(AC \cdot AB) \cos A}$$

$$AB = \sqrt{15^2 + 10^2 - 2(15 \times 10) \cos 120^\circ}$$

$$AB = \sqrt{325 - 300 \cos(120^\circ)} = 21.8 \text{ m}$$

Q2d

$$\frac{BE}{\sin A} = \frac{AB}{\sin C} \quad \frac{21.8}{\sin 120^\circ} = \frac{15}{\sin C}$$

$$\sin C = \frac{15 \sin(120^\circ)}{21.8} = 0.6$$

$$C = \sin^{-1}(0.6) = 36.9^\circ$$

Q2b

5/5

$$\frac{BC}{\sin A} = \frac{AC}{\sin B} \quad \checkmark \quad \frac{21.8}{\sin(120^\circ)} = \frac{10}{\sin B} \quad \checkmark$$

$$\sin B = \frac{10 \sin(120^\circ)}{21.8} = 0.4 \quad \checkmark$$

$$B = \sin^{-1}(0.4) = \underline{\underline{23.6^\circ}} \quad \checkmark \quad 2_{//} \quad \checkmark$$

C

?

Q2C0/6

④ $y = x^2 - 4x + 3$ / $y = 2x + 1$

$$x^2 - 4x + 3 = 2x + 1$$

$$x^2 - 6x + 2 = 0$$

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

$$x = \frac{6 \pm \sqrt{36 - 4(1)(2)}}{2(1)} = 5.65 \text{ and } 0.35$$

when $x = 5.65$

$$y = 2(5.65) + 1 = 12.3 \quad (5.65 \checkmark 12.3)$$

when $x = 0.35$ $y = 2(0.35) + 1 \quad (0.35 \checkmark 1.7)$

Q2d

6/6

⑤

(i) $2 \sin x = 0.75$

$$x = \sin^{-1}\left(\frac{0.75}{2}\right) = 22.02^\circ \text{ and } 157.98^\circ$$

(ii) $4 \cos x = 0$ / $4 \cos x = 1$

$$x = \cos^{-1}\left(\frac{1}{4}\right) = 75.52^\circ \text{ and } 284.48^\circ$$

show workings

(iii) $-5 \tan x = 1$ / $\tan x = -\frac{1}{5}$

$$x = \tan^{-1}\left(-\frac{1}{5}\right) = 11.30^\circ \text{ not answer}$$

$$180^\circ - 11.3^\circ = 168.7^\circ \text{ and } 348.7^\circ$$

Q2e

6/7

Q3

a

i

$$\ln(2x-3) \cdot 3 = \ln(5x+9)$$

$$6x-9 = 5x+9, \quad x-9=9$$

$$x = 18$$

$$\text{ii) } \log(3x+2)(x+1) = \log 15$$

$$3x^2 + 3x + 2x + 2 = 15$$

$$3x^2 + 5x - 13 = 0$$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(3)(-13)}}{2(3)}$$

$$x = \frac{-5 \pm \sqrt{25 - 4(3)(-13)}}{6} = \frac{1.41}{6} \text{ and } \frac{-3.1}{6}$$

$$\text{iii) } \log_4(x+3) \times 2^{(2-x)} = \log_8(x+1)$$

$$\log_4(x+3) + \log_2(2-x) = \log_8(x+1)$$

$$(x+3)\log_4 4 + (2-x)\log_2 2 = (x+1)\log_8 8$$

$$(x+3)0.6 + (2-x)0.3 = (x+1)0.9$$

$$0.6x + 1.8 + 0.6 + 0.3x = 0.9x + 0.9$$

$$1.2x + 2.4 = 0.9x + 0.9$$

$$0.3x + 1.5 = 0$$

$$x = -5 \quad \text{E.C.F.}$$

E.C.F.

iv

$$\frac{6x+1}{3x-2} = \frac{4}{5}$$

$$3x + 5 = 12x - 8$$

E.C.F.

$$-9x = -13$$

$$x = 1.44 \quad \text{E.C.F.}$$

Show workings.

Q3

29/32

22/32

Q3a

12/18

① [

②

Ⓐ

① $P^2 - 13P + 42$ $(P-6)(P-7)$ 2

Q3b

ⓑ

① $4b^2 - 49$ $(2b-7)(2b+7)$ 2

6/6

ⓒ

① $mn + 5mp + 3nq + 15pq$
 $m(n+5p) + 3q(n+5p)$ 2
 $(m+3q)(n+5p)$

Ⓒ

① $6m^2 + 17m + 12 = 0$

Q2c

?

0/4

d

$$3\omega^2 - 2\omega - 8 = 0$$

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

$$\omega = \frac{2 \pm \sqrt{4 - 4(3)(-8)}}{6} = 2 \text{ and } -1.33$$

$$\omega = \underline{2} \text{ and } \underline{-1.33}$$

4Q2d4/4

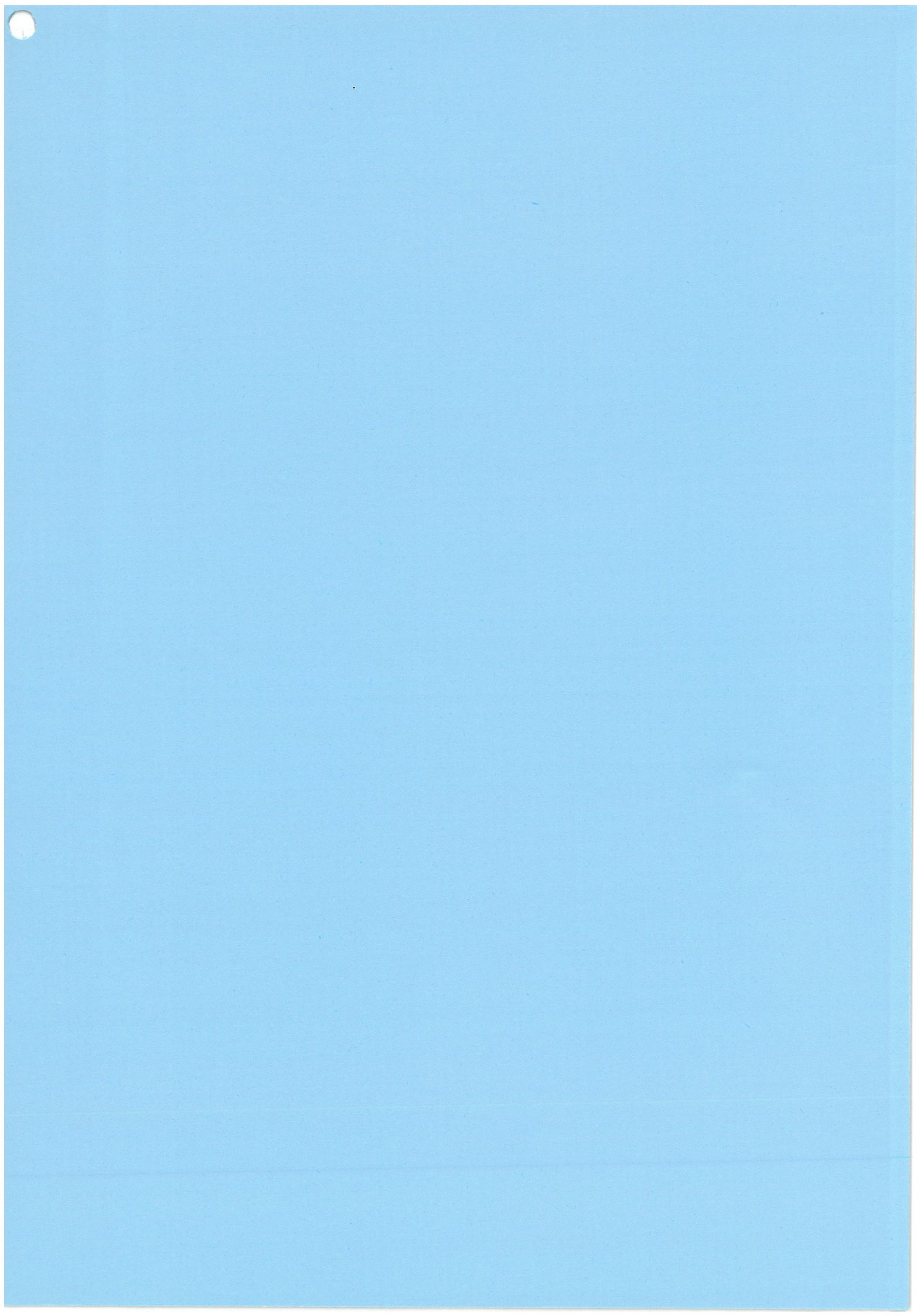


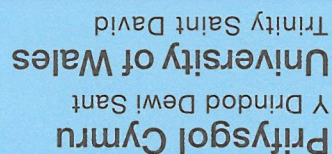
Question No.

Examiner Only

Arholwr yn unig

Rhif y Cwestiwn





12 Tudalen

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

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

3. Rhaid i'r atebion fod mewn llawysgriften ddarlennadwy. Gall yr Arholwyr naill ai anwybyddu sgrïpt annarlennadwy, neu drefnu iddi gael ei theipio a chael yr ymgeisydd i dalu.

4. Ysgriennwch eich atebion mewn inc.

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 gwyblywr/gwyliwr.

8. Rhaid dychwelyd pob llyfr. Ni chaniateir 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 Myfyriwr	

Cyflanswmm	
Rhestrwch rifau'r cwestiynau a ymgeistwyd gennyh	Af Ddiabenion y Swyddfa

(See the other side for English version)

CYFENN:

ENW(AU) CYNTAF:

Llenwch, plynwch a selwch
(gweler nodyn 2 isod)