



## 12 Pages

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.**

[illegible]

(Gweler yr ochr arall am y fersiwn Cymraeg)

**SURNAME:** Morgan

FORENAME(S): Mason Richard

(See the other side for English version)

|   |                                         |  |
|---|-----------------------------------------|--|
| 1 | Rhif Myfyriwr                           |  |
| 2 | Teitl y Papur<br>Arholiad               |  |
| 3 | Cod y Modwl                             |  |
| 4 | Dyddiad ac Amser yr<br>Arholiad         |  |
| 5 | Lleoliad yr Arholiad                    |  |
| 6 | Rhif Sedd                               |  |
| 7 | Nifer y Llyfrau Atebion<br>a gyflwynwyd |  |

[illegible]

8. Rhaid dychwelyd pob llyfr. Ni chaniat  
arholl o dan unrhyw amgylchiadau.

3. Rhaid i'r atebion fod mewn llawysgriften ddarllenadwy. Gall yr Arholwyr naill ai anwybyddu sgrïpt annarllenadwy, neu drefnu iddi gael ei theipio a chael yr ymgeisydd i dalu.
4. Ysgrifennwch eich atebion mewn inc.
5. Dechreuwch bob ateb ar dudalen newydd. Gwnewch unrhyw ffras 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 gwylwyr/gwylwyr.

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 at y sello i lawr (gan ddefnyddio'r label a ddarparwyd) i guddio'ch enw.

## Cyfarwyddiadau i Ymgeiswyr

12 Tudalen

## Llyfr Atebion Arholiadau



**Prifysgol Cymru**  
Y Drindod Dewi Sant  
**University of Wales**  
Trinity Saint David

Llenwch, plygwh a seliwch  
(gweler nodyn 2 isod)

**CYFENW:**

ENW(AU) CYNTAF:

$$\begin{aligned}
 1. \quad & 3(4y-3) - 5(2-3y) = 35 \\
 & 12y - 9 - 10 + 15y = 35 \\
 & 27y - 19 = 35 \\
 & 27y = 35 + 19 \\
 & 27y = 54 \\
 & y = \frac{54}{27} \\
 & y = 2
 \end{aligned}$$

Answer = 2 ✓

5

$$\begin{aligned}
 2i. \quad & 4 \begin{pmatrix} -1 & 3 \\ 2 & 5 \end{pmatrix} - 2 \begin{pmatrix} 3 & 2 \\ 1 & 3 \end{pmatrix} \\
 & \begin{pmatrix} -4 & 12 \\ 8 & 20 \end{pmatrix} - \begin{pmatrix} 6 & 4 \\ 2 & 6 \end{pmatrix} = \begin{pmatrix} -10 & 8 \\ 6 & 14 \end{pmatrix}
 \end{aligned}$$

Answer =  $\begin{pmatrix} -10 & 8 \\ 6 & 14 \end{pmatrix}$  ✓

2

$$\begin{aligned}
 ii. \quad & \begin{pmatrix} 3 & 2 \\ 1 & 3 \end{pmatrix} \begin{pmatrix} -1 & 3 \\ 2 & 5 \end{pmatrix} = \begin{pmatrix} 3 \times -1 + 2 \times 2 & 3 \times 3 + 2 \times 5 \\ 1 \times -1 + 3 \times 2 & 1 \times 3 + 3 \times 5 \end{pmatrix} \\
 & = \begin{pmatrix} 1 & 19 \\ 5 & 18 \end{pmatrix}
 \end{aligned}$$

Answer =  $\begin{pmatrix} 1 & 19 \\ 5 & 18 \end{pmatrix}$  ✓

5

$$iv. \quad \begin{pmatrix} 3 & 2 \\ 1 & 3 \end{pmatrix} = (3 \times 3) - (2 \times 1) = 7 \quad |A| = 9 - 2 = 7$$

$$A^{-1} = \frac{1}{7} \begin{pmatrix} 3 & -2 \\ -1 & 3 \end{pmatrix} = \begin{pmatrix} \frac{3}{7} & -\frac{2}{7} \\ -\frac{1}{7} & \frac{3}{7} \end{pmatrix} \quad \text{or} \quad \begin{pmatrix} 0.429 & -0.286 \\ -0.143 & 0.429 \end{pmatrix} \quad \text{answer} = \begin{pmatrix} \frac{3}{7} & -\frac{2}{7} \\ -\frac{1}{7} & \frac{3}{7} \end{pmatrix}$$

5

12

12

$$\begin{aligned}
 3i. \quad & (3 - j5) - (2 + j3) \\
 & = 1 - j8
 \end{aligned}$$

Answer =  $1 - j8$  ✓

2.

$$\begin{aligned}
 ii. \quad & (3 - j5)(2 + j3) \\
 & = 6 + j9 - j10 - j^2 15 \\
 & = 21 - j1
 \end{aligned}$$

Answer =  $21 - j1$  ✓

3

$$\begin{aligned}
 iii. \quad & \frac{(3 - j5) \times (2 - j3)}{(2 + j3)(2 - j3)} = \frac{6 - j9 - j10 + j^2 15}{4 - j6 + j6 - j^2 9} \\
 & = \frac{-9 - j19}{10}
 \end{aligned}$$

Answer =  $-9 - j19$  ✓

2

7

10

$$4. \quad y = 3x^5 - \frac{4}{x^2} + \sqrt{x}$$

$$\begin{aligned}
 y &= 3x^5 - 4x^{-2} + x^{\frac{1}{2}} \\
 \frac{dy}{dx} &= 15x^4 - (-8x^{-3}) + \frac{1}{2}x^{-\frac{1}{2}} \\
 &= 15x^4 + 8x^{-3} + \frac{1}{2}x^{-\frac{1}{2}}
 \end{aligned}$$

Answer =  $15x^4 + 8x^{-3} + \frac{1}{2}x^{-\frac{1}{2}}$  ✓

5

5.  $\int_2^3 (4 + 5t + 3t^2) dt$

$$\frac{d}{dt} = 5 + 6t$$

$$= [5 + 6t]_2^3$$

$$= [5 + 6(3)] - [5 + 6(2)]$$

$$= 23 - 17 = 6$$

Answer = 6

b.  $\int_3^5 \frac{6}{(x+1)(x-2)} dx$   $h = \frac{5-3}{4} = \frac{1}{2}$  or 0.5

|   |     |     |     |       |     |       |       |
|---|-----|-----|-----|-------|-----|-------|-------|
| y | 3   | 3.5 | 4   | 4.5   | 5   | 5.5   | 6     |
| x | 1.5 | 0.8 | 0.6 | 0.436 | 0.3 | 0.264 | 0.214 |

$y = f(x) = \frac{6}{(x+1)(x-2)}$

Area =  $h \left\{ \frac{1}{2}(y_0 + y_n) + y_1 + y_2 + y_3 + \dots \right\}$

$0.5 \left( \frac{1}{2}(3 + 6) + 3.5 + 4 + 4.5 + 5 + 5.5 \right)$

$= 13.5$

$0.5 \left( \frac{1}{2}(1.5 + 0.214) + 0.8 + 0.6 + 0.436 + 0.3 + 0.264 \right)$

$= 1.6285$

Answer = 1.6285

2a.  $L_1: 4x + 2y - 6 = 0$

$L_2: 3y - 6x = 3$

i.  $2y = -4x + 6$

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

$y = -2x + 3$

gradient of  $L_1: -2$

intercept of  $L_2: 3$

ii.  $2y = -4x + 6$

$y = -4x + 6$

$m = -4$  perp  $m = \frac{1}{4}$

$y = \frac{1}{4}(b) + c$

$y = 1.5 + c$

$c = 1.5 + c$

$y = \frac{1}{4}x + 1.5$

b.  $S = t^4 \sin 3t$   $t = 1.5$

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

$U = t^4$   $V = \sin 3t$

$\frac{dU}{dt} = 4t^3$   $\frac{dV}{dt} = 3\cos 3t$

$\frac{dS}{dt} = (4t^3)(3\cos 3t) + (\sin 3t)(4t^3)$

$= 12t^3 \cos 3t + 4t^3 \sin 3t$

$= 12(1.5)^3 \cos(3 \times 1.5) + 4(1.5)^3 \sin(3 \times 1.5)$

$= -3.79432439 + (-13.19665659)$

$= -16.99098098$

here  $S = f(t)$

$\therefore \frac{dS}{dt} =$

## Section B

1.  $\frac{6}{(x+1)(x-2)} = \frac{A}{(x+1)} + \frac{B}{(x-2)}$

$6 = A(x-2) + B(x+1)$

put  $x = 2$

$6 = A(0) + B(2+1)$

$6 = B(3)$

$B = \frac{6}{3}$

$B = 2$

Answer = -2, 2

put  $x = -1$

$6 = A(-1-2) + B(0)$

$6 = A(-3)$

$\frac{6}{-3} = A$

$A = -2$

$\frac{-2}{(x+1)} + \frac{2}{(x-2)}$

ii)  $\int_3^5 \frac{6}{(x+1)(x-2)} dx$  needed here!

$\left[ \frac{-2}{(x+1)} + \frac{2}{(x-2)} \right]_3^5$

$= [-2 \ln(x+1) + 2 \ln(x-2)] - [-2 \ln(x+1) + 2 \ln(x-2)]_3^5$

$= [-2 \ln(6) + 2 \ln(3)] - [-2 \ln(4) + 2 \ln(1)]$

$= -1.386294361 - (-2.772588722)$

$= 4.158883083$

$= 4.159$  (3.d.p.)

Answer = 4.159

5

$$C. i = 2(3 - e^{-10t})$$

$$i = 6 - 2e^{-10t}$$

$$3a. \begin{aligned} I_1 + I_2 (I_1 + I_2) &= K_1 \\ I_2 + I_1 (I_2 + I_1) &= K_2 \\ 10 + 6(I_1 + I_2) &= 51 \\ 16 + 8(I_2 + I_1) &= 52 \\ 16I_1 + 6I_2 &= 6 \\ 6I_1 + 14I_2 &= 10 \end{aligned}$$

Cramer's rule

$$I_1 = \frac{\begin{vmatrix} 6 & 6 \\ 10 & 14 \end{vmatrix}}{\begin{vmatrix} 16 & 6 \\ 6 & 14 \end{vmatrix}} = \frac{(6 \times 14) - (6 \times 10)}{(16 \times 14) - (6 \times 6)} = \frac{24}{188} = 0.128 \text{ A}$$

$$I_2 = \frac{\begin{vmatrix} 16 & 6 \\ 6 & 10 \end{vmatrix}}{\begin{vmatrix} 16 & 6 \\ 6 & 14 \end{vmatrix}} = \frac{(16 \times 10) - (6 \times 6)}{188} = \frac{124}{188} = 0.659 \text{ A}$$

Answer = 0.128 A, 0.659 A

$$b. \begin{aligned} 16I_1 + 6I_2 &= 6 \quad \times 10 \\ 6I_1 + 14I_2 &= 10 \quad \times 16 \\ 160I_1 + 60I_2 &= 60 \\ 160I_1 + 224I_2 &= 160 \\ -164I_2 &= -100 \\ I_2 &= \frac{-100}{-164} \\ I_2 &= 0.60975 \text{ A} \end{aligned}$$

Answer = 0.244 A, 0.610 A

$$\begin{aligned} 6I_1 + 14(0.60975) &= 10 \\ 6I_1 + 8.5365 &= 10 \\ 6I_1 &= 10 - 8.5365 \\ 6I_1 &= 1.4635 \\ I_1 &= \frac{1.4635}{6} \\ I_1 &= 0.243916 \text{ A} \end{aligned}$$

1

8/20

input

transfer matrix

Not marked.

$$4. \begin{pmatrix} E_1 \\ I_1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ \frac{1}{2} & 1 \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} E_2 \\ I_2 \end{pmatrix}$$

$$\begin{pmatrix} E_1 \\ I_1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ \frac{1}{60} & 1 \end{pmatrix} \begin{pmatrix} 1 & 40 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 \times 1 + (0 \times 0) & (1 \times 40) + (0 \times 1) \\ (\frac{1}{60} \times 1) + (1 \times 0) & (\frac{1}{60} \times 40) + (1 \times 1) \end{pmatrix}$$

$$= \begin{pmatrix} 1 & 40 \\ \frac{1}{60} & \frac{5}{3} \end{pmatrix}$$

$$= \begin{pmatrix} 1 & 40 \\ \frac{1}{60} & \frac{5}{3} \end{pmatrix} \begin{pmatrix} 110 \text{ V} \\ 4 \text{ A} \end{pmatrix} = \begin{pmatrix} 1 \times 110 + (40 \times 4) \\ (\frac{1}{60} \times 110) + (\frac{5}{3} \times 4) \end{pmatrix}$$

$$= \begin{pmatrix} 270 \text{ V} \\ 8.5 \text{ A} \end{pmatrix}$$

$$E_1 = 270 \text{ V}$$

$$I_1 = 8.5 \text{ A}$$

Answer = 270 V, 8.5 A

12.

X0

12/20