

**Complete, fold and seal
(see note 2 below)**

SURNAME: Willis

FORENAME(S): Khys

Examination Answer Books

12 Pages

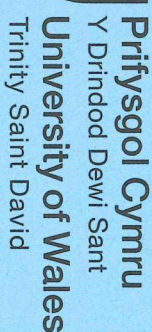
Instructions to Candidates

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.

1	Student Number	
2	Title of Examination Paper	9:30 Engineering Maths
3	Module Code	SGEE4002
4	Date and Time of Examination	9:30 13/5/2024
5	Examination Venue	
6	Seat Number	
7	Number of Answer Books handed in	

(Gweler yr ochr arall am y fersiwn Cymraeg)



Llyfr Atebion Arholiadau

12 Tudalen

Cyfarwyddiadau i Ymgeiswyr

1. Rhowch yr holl wybodaeth y gofynnir amdani yn y blychau isod.
2. Rhowch eich enw yn y lle a ddarparwyd ar y dde, plygwch ef at selio i lawr (gan ddefnyddio'r label a ddarparwyd) i guddio'ch enw.
3. Rhaid i'r atebion fod mewn llawysgrifen ddatlenadwy. Gall yr Arholwyr naill ai anwybyddu sgrïpt annatlenadwy, neu drefnu icdi gael ei theipio a chael yr ymgeisydd i dalu.
4. Ysgrifennwch eich atebion mewn inc.
5. Dechreuwch bob ateb ar dudalen newydd. Gwnewch unrhyw frâs 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 gwyliwr/gwyliwyr.
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.

Llenwch, plygwch a seliwch (gweler nodyn 2 isod)

CYFENW:

ENW(AU) CYNTAF: _____

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

$$1.a) \quad v^2 = u^2 + 2as$$

$$\frac{v^2 - u^2}{2s} = a$$

$$a = \frac{v^2 - u^2}{2s} \quad \checkmark$$

3

$$b.) \quad v = \frac{v_0}{\sqrt{r^2 - 1}}$$

$$\frac{v}{v_0} = \frac{1}{\sqrt{r^2 - 1}}$$

$$\frac{v_0}{v} = \sqrt{r^2 - 1}$$

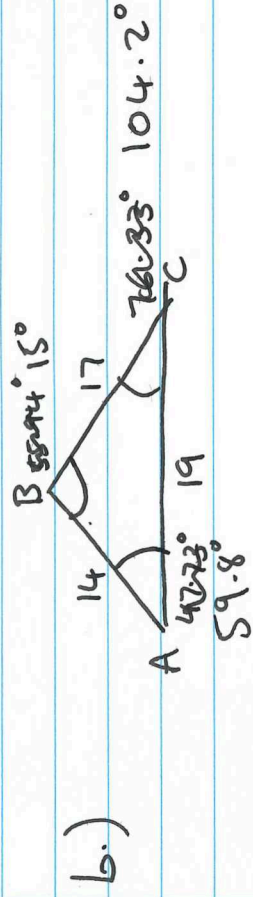
$$4 + \left(\frac{v_0}{v}\right)^2 = r^2 - 1$$

$$1 + \left(\frac{v_0}{v}\right)^2 = r^2$$

$$\sqrt{1 + \left(\frac{v_0}{v}\right)^2} = r \quad \checkmark$$

2.2

[illegible]

cos⁻¹ 0.59

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$17^2 - (14^2 + 19^2) = 2 \cdot 14 \cdot 19 \cos \theta$$

$$\frac{17^2 - (14^2 + 19^2)}{2 \cdot 14 \cdot 19} = \cos \theta$$

$$\cos \theta = \frac{0.503}{0.503} = \cos^{-1}(0.503) = 59.4^\circ$$

0.96

$$\left(\frac{\sin 59.8}{17} = \frac{\sin B}{19} \right) = \frac{\sin B}{19} = \frac{\sin 59.8}{17} = \frac{0.96}{17} = 0.056$$

$$\frac{19 \sin 59.8}{17} = \sin B = 0.96$$

$$= 15^\circ$$

$$180 - (59.8 + 15^\circ) = 104.2^\circ$$

$$= 104.2^\circ$$

$$= 104.2^\circ$$

$$= 104.2^\circ$$

$$C = 104.2^\circ$$

$$C = 104.2^\circ$$

$$C = 104.2^\circ$$

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$$10.) \quad A = \begin{bmatrix} 4 & 5 \\ 6 & 7 \end{bmatrix} \quad B = \begin{bmatrix} 8 & 9 \\ 10 & 11 \end{bmatrix}$$

$$A + B = \begin{bmatrix} 12 & 14 \\ 16 & 18 \end{bmatrix}$$

$$A - B = \begin{bmatrix} -4 & -4 \\ -4 & -4 \end{bmatrix}$$

$$A \times B = \begin{bmatrix} 82 & 91 \\ 118 & 131 \end{bmatrix}$$

$$\begin{aligned} &= (4 \times 8 + 5 \times 10) = 82 \\ &= (6 \times 8 + 7 \times 10) = 118 \\ &= (4 \times 9 + 5 \times 11) = 91 \\ &= (6 \times 9 + 7 \times 11) = 131 \end{aligned}$$

$$11.) \quad \sin(5x + 2)$$

$$\text{Let } u = (5x + 2) \quad v = \sin u$$

$$\frac{du}{dx} = 5 \quad \frac{dv}{du} = \cos u$$

$$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dv}{du}$$

$$= 5 \times \cos u = 5 \cos(5x + 2)$$

Question No.	Examiner Only	Question No.	Examiner Only
12.) $x^2 e^{-x}$		14.) $\int x \sin x \, dx$ let $u = x$ $dv = \sin x$	
let $u = x^2$ $v = e^{-x}$		$\frac{du}{dx} = 2x$ $\frac{dv}{dx} = -e^{-x}$	
$\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$		$\int u \frac{dv}{dx} \, dx = uv - \int v \frac{du}{dx} \, dx$	
$\frac{dy}{dx} = x^2 e^{-x} + e^{-x} 2x$		$\int x \sin x \, dx = x(-\cos x) - \int (-\cos x)(1) \, dx$ $= -x \cos x + \sin x + C$	5.
$\frac{dy}{dx} = -x^2 e^{-x} + 2x e^{-x}$			
13.) $\frac{3x-4}{2x+1}$ let $u = 3x-4$ $v = 2x+1$		$\frac{2x+5}{(x-2)(x+1)} = \frac{A}{(x-2)} + \frac{B}{(x+1)}$	5.)
$\frac{du}{dx} = 3$ $\frac{dv}{dx} = 2$		$\frac{2x+5}{(x-2)(x+1)} = \frac{A(x-2)(x+1)}{(x-2)} + \frac{B(x-2)(x+1)}{(x+1)}$	
$\frac{dy}{dx} = \frac{du}{dx} v - u \frac{dv}{dx} \frac{1}{v^2}$		$2x+5 = A(x+1) + B(x-2)$	
$\frac{dy}{dx} = (2x+1)(3) - \frac{(3x-4)(2)}{(2x+1)^2}$		let $x = -2$	
$\frac{dy}{dx} = \frac{(6x+3) - (6x-8)}{(2x+1)^2}$		$2(-2)+5 = A(2+1) + B(2-2)$ $9 = A3$ $\frac{9}{3} = A$ $3 = A$	
		let $x = -1$	
		2	2

Question No.	Examiner Only	Question No.	Examiner Only
	let $x = -1$ $2x + 5 = A(x+1) + B(x-2)$ $2(-1) + 5 = A(-1+1) + B(-1-2)$ $3 = 0 - 3B$ $3 = -3B$ $B = -1$ $\frac{(2x+5)}{(x-2)(x+1)} = \frac{3}{(x-2)} + \frac{-1}{(x+1)}$ b.) $5x^2 + 17x + 15 = \frac{A}{(x+2)} + \frac{B}{(x+2)^2} + \frac{C}{(x+1)}$ $5x^2 + 17x + 15 = \frac{A(x+2)^2(x+1)}{(x+2)} + \frac{B(x+2)^2(x+1)}{(x+2)^2} + \frac{C(x+2)^2(x+1)}{(x+1)}$ $A(x+2)(x+1) + B(x+1) + C(x+2)^2$ Equating let $x = -2$ to cancel A + C $5(-2)^2 + 17(-2) + 15 = A(-2-2)B(-2+1)$ 5 $1 = -1B$ $1 = B$ -1 let $x = -1$		
Answer yn unig	Answer yn unig		
6	3		

Question No.	Examiner Only	Question No.	Examiner Only
	let $x = -1$ $5x^2 + 17(-1) + 15 = C(-1+2)^2$ $3 = C(-1+2)^2$ $3 = 1C$ $3 = 3$ $C = 3$ Equating co-efficients		
Answer yn unig	Answer yn unig		
3	3		