



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

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:

Hill

FORENAME(S):

Callum - James

1	Student Number	P148699
2	Title of Examination Paper	CAE & STRESS Analysis
3	Module Code	M5X02064
4	Date and Time of Examination	9/05/19 12:00pm
5	Examination Venue	IQ Building
6	Seat Number	G053
7	Number of Answer Books handed in	

List the numbers of the questions you have attempted	Office Use
1	9
2	15
3	9
Total	33



1a)

$$\sigma_H = \frac{Pd}{2t}$$

$$\uparrow F = \downarrow F$$

$$\uparrow F = \text{Pressure} \times \text{area}$$

$$\uparrow F = P \times d \times L$$

$$\downarrow F = \sigma_H \times 2 \times t \times L$$

$$P \times d \times L = \sigma_H \times 2 \times t \times L$$

$$\Rightarrow \sigma_H = \frac{Pd}{2t}$$

$$\text{Therefore, } \sigma_H = \frac{Pd}{2t}$$

1b) i) $\sigma_H = 200 \text{ MPa}$ $d = 3.5 \text{ m}$ $t = 0.5 \times 10^{-3} \text{ m}$

$$\sigma_H = \frac{Pd}{2t}$$

$$200 \times 10^6 = \frac{P \times 3.5}{2 \times (0.5 \times 10^{-3})}$$

$$\therefore P = \frac{(200 \times 10^6) \times 2 \times (0.5 \times 10^{-3})}{3.5}$$

$$P = 57.14 \times 10^3 \text{ pascals}$$

$$P = \rho g h$$

$$\therefore h = \frac{P}{\rho g}$$

1d)

~~ONE PD~~~~REVERSED~~~~← F = P × d~~~~← F = P × π d^2~~~~→ F = P × π d^2~~~~P × π d^2~~~~σ_H = P × π d^2~~

1d)

~~← F = P × d~~

$$\sigma_H = \frac{Pd}{4t}$$

$$\leftarrow F = F \rightarrow$$

$$\leftarrow F = P \times \frac{\pi d^2}{4}$$

$$\rightarrow F = \sigma_H \times \pi d t$$

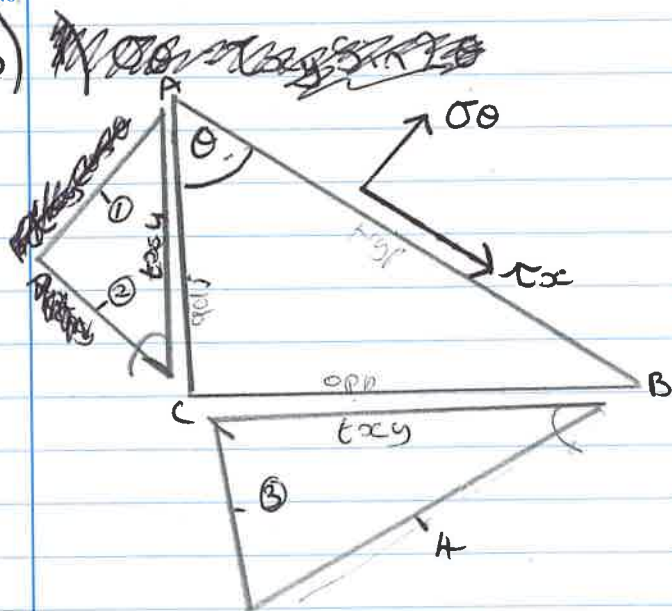
$$\frac{P \times \pi d^2}{4} = \sigma_H \times \pi d t$$

$$\sigma_H = \frac{P \times \pi d^2}{4 \pi d t}$$

$$\sigma_H = \frac{Pd}{4t}$$

(4)

26)



~~Answer~~

- ① $AC \tau_{xy} \sin \theta$
- ② $AC \tau_{xy} \cos \theta$
- ③ $BC \tau_{xy} \sin \theta$
- ④ $BC \tau_{xy} \cos \theta$

26i)

$$AB \sigma_\theta = AC \tau_{xy} \sin \theta + BC \tau_{xy} \cos \theta$$

$$\text{S.F. } C_A \text{ TR} \quad \sin \theta = \frac{BC}{AB} \quad \cos \theta = \frac{AC}{AB} \quad \tan \theta = \frac{BC}{AC}$$

$$\frac{AB}{AB} \sigma_\theta = \frac{AC}{AB} \tau_{xy} \sin \theta + \frac{BC}{AB} \tau_{xy} \cos \theta$$

$$\sigma_\theta = \cos \theta \tau_{xy} \sin \theta + \sin \theta \tau_{xy} \cos \theta$$

~~$$\sigma_\theta = \tau_{xy} \cos \theta \sin \theta$$~~

$$\sigma_\theta = \tau_{xy} \sin \theta \cos \theta + \tau_{xy} \sin \theta \cos \theta$$

$$\sigma_\theta = 2 \tau_{xy} \sin \theta \cos \theta$$

$$\text{Since } \sin \theta \cos \theta = \frac{1}{2} \sin 2\theta$$

$$\sigma_\theta = 2 \tau_{xy} \frac{1}{2} \sin 2\theta$$

$$\sigma_\theta = \frac{2 \tau_{xy} \sin 2\theta}{2}$$

$$\sigma_\theta = \tau_{xy} \sin 2\theta$$

5

~~Answer~~

~~$$AB \sigma_\theta = AC \tau_{xy} \sin \theta + BC \tau_{xy} \cos \theta$$~~

~~$$\frac{AB}{AB} \sigma_\theta + \frac{AC}{AB} \tau_{xy} \cos \theta = \frac{BC}{AB} \tau_{xy} \sin \theta$$~~

~~$$\sigma_\theta = \cos \theta \tau_{xy} \cos \theta = \sin \theta \tau_{xy} \sin \theta$$~~

~~For next~~
~~new τ_{xy} cos²~~

$$2bii) \quad \frac{AB \tau_{\theta}}{AB} = \frac{AC \tau_{xy} \cos \theta}{AB} + \frac{BC \tau_{xy} \sin \theta}{AB}$$

$$\tau_{\theta} = \tau_{xy} \cos^2 \theta + \tau_{xy} \sin^2 \theta$$

~~$\tau_{\theta} = \tau_{xy} \cos^2 \theta + \tau_{xy} \sin^2 \theta$~~
 ~~$\tau_{\theta} = \tau_{xy} (\cos^2 \theta + \sin^2 \theta)$~~

~~$\tau_{\theta} = \tau_{xy} (\cos^2 \theta + \sin^2 \theta)$~~

$$\tau_{\theta} = \tau_{xy} \sin^2 \theta - \tau_{xy} \cos^2 \theta$$

$$\tau_{\theta} = (\sin^2 \theta - \cos^2 \theta) \tau_{xy}$$

$$\text{Since } \sin^2 \theta - \cos^2 \theta = -\cos 2\theta$$

~~$\tau_{\theta} = -\cos 2\theta \tau_{xy}$~~

$$\tau_{\theta} = -\cos 2\theta \tau_{xy}$$

$$\tau_{\theta} = -\tau_{xy} \cos 2\theta$$

$$2c) \quad a = 800 \times 10^{-3} \text{ m}^2 \quad \sigma_x = 45 \times 10^3 \text{ N} \quad \theta = 20^\circ$$

$$\sigma_{\theta} = \frac{1}{2} (\sigma_x + \sigma_y) + \frac{1}{2} (\sigma_x - \sigma_y) \cos 2\theta$$

$$\sigma_{\theta} = \frac{1}{2} (45 \times 10^3 + 0) + \frac{1}{2} (45 \times 10^3 - 0) \cos 2(20)$$

$$\sigma_{\theta} = 43.64 \times 10^3 \text{ N/m}^2$$

~~$\sigma_{\theta} = \frac{1}{2} (45 \times 10^3)$~~

$$\tau_{\theta} = \frac{1}{2} (\sigma_x - \sigma_y) \sin 2\theta$$

$$\tau_{\theta} = \frac{1}{2} (45 \times 10^3) \sin 2(20)$$

$$\tau_{\theta} = 7.7 \times 10^3 \text{ N/m}^2$$

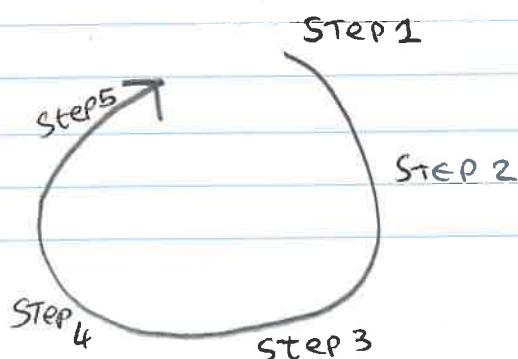
3a) A Design Problem is more broad and may have an array of solutions whereas an analysis problem will have one solution.

(2)

3b) design problems are more iterative as the ~~for each~~ solutions may not always be viable as they may not be Affordable, Safe or may not work ~~therefore~~ ~~and so~~ therefore making it more Cyclic or iterative. Whereas, an analysis problem ~~will only have an analytical solution making it more straight forward~~ and process seems to follow certain steps and does not stray like an design problem making it a more sequential process.

(4)

3c) One theory is the 5 step design process
 Step 1 - define the problem, make sure it is a viable problem
 Step 2 - ~~Generate multiple solutions~~, Gather relative information, has this problem already been solved? By what manufacturer?
 What are the disadvantages/advantages of the current solution?
 Step 3 - Generate Multiple solutions - Brainstorm, Bring people in from different disciplines.
 Step 4 - Analyse & select solution - strength test, etc. Allow designers to take risks.
 Step 5 - Select & Implement solution - put the design into process.



(3)

Question No.

Examiner On

10/ AS

Question No.

Examiner Only

Arholwr yn unig

Rhif y Cwestiwn

Question No.

Examiner Only

Question No.

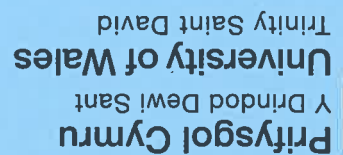
Examiner Only

Question No.

Examiner Only

Arholwr yn unig

hif 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 et 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 nall ai anwybyddu sgript annarllennadwy, neu drefnu iddi! gael ei theipio a chael yr ymgeisydd i dalu.

4. Ysgriptennwch eich atebion mewn inc.

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

6. Ni ddylid rhwygo 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 gwybllwr/gwyblyr.

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 Archoliad	
3	Cod y Modwl	
2	Teitl y Papur Arholiad	
1	Rhif Myfyriwr	

[illegible]

(See the other side for English version)

Llenwch, plygwrch a selwch
(gweler nodyn 2 isod)

CYFENN:

ENW(AU) CYNTAF:

ENW(AU) CYNTAF: