



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

Dzer

Iwan Rhys

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	P149128
2	Title of Examination Paper	CAE
3	Module Code	55X02064
4	Date and Time of Examination	12 pm
5	Examination Venue	3, 10
6	Seat Number	G013
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
1	12
2	19
3	9
Total	40

(Gweler yr ochr arall am y fersiwn Cymraeg)

66.7%



Q1 a

$$\text{Stress} = \frac{\text{Force}}{\text{area}}$$

$$\text{Force} = p \times \pi d$$

$$20\pi t = p \pi d$$

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

/ (4)

b i

$$\sigma_{H_{\max}} = 200 \times 10^6 \text{ Pa}$$

$$d = 3.5 \text{ m}$$

$$t = 0.5 \times 10^{-3} \text{ m}$$

$$\sigma_H \times \frac{2 \times t}{d} = p = 67.14285714 \times 10^3 \text{ Pa}$$

$$\rho = \text{kg/cm}^3 = \text{kg}/(\text{cm}^3 \times 100)$$

$$\frac{1.03}{100} \rightarrow 0.0103 \text{ kg/m}^3$$

$$p = \rho g H$$

$$\frac{67.14285714 \times 10^3}{0.0103 \times 9.81} = H$$

$$p = \rho g H$$

$$\frac{67.1428 \times 10^3}{1.03 \times 9.81} = 5685.3 \text{ m}$$

$$= 15000 \text{ feet}$$

(1)

X

$$b) 57.1428514 \times 10^3$$

$$\frac{57.1428514 \times 10^3}{0.768 \times 9.81} = 7984.88 \text{ m}$$

$$= 25000 \text{ feet}$$

x (0)

C a passeride cabb along the plain to travel a lot high as the stress on the walls of the plain are allowed to ~~exp~~ remain under pressure so the plain ~~is around~~ ~~so~~ can keep it stretched and fly much high as they remain under it yield strength. x (0)



$$\text{Stress} = \frac{\text{Force}}{\text{area}}$$

$$\text{Force} = p \frac{\pi d^2}{4}$$

$$\text{Area} = \pi d t$$

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

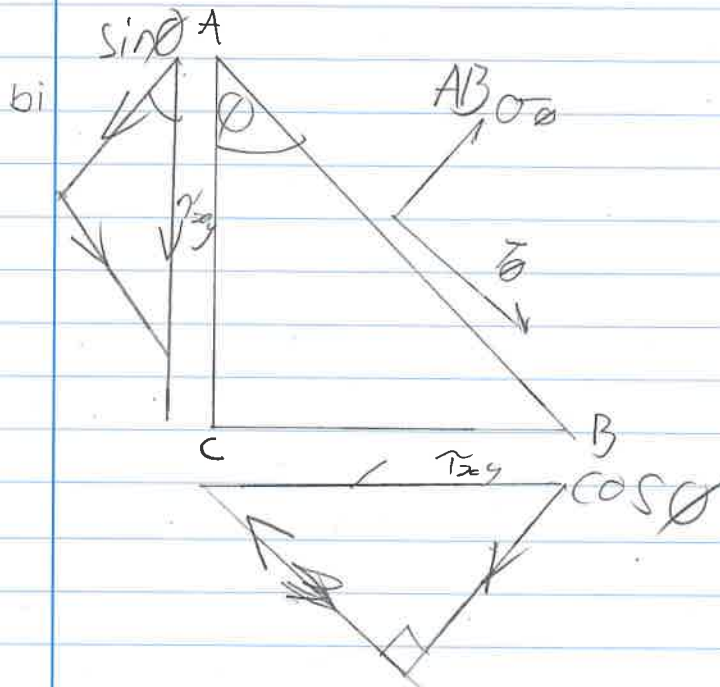
x (0)

②

Spherical tank ~~the~~ of the same thickness as a cylindrical tank can take far higher stresses. tho they must have a bigger diameter to compensate. this mean that there foot print is much bigger mean, less effective use of space - so high pressure products are kept in spherical tank, and less pressure products are kept in cylindrical tanks.

13

2a principal stress is the maximum and minimum stress the object will undergo and principal plane is where about them force act.



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

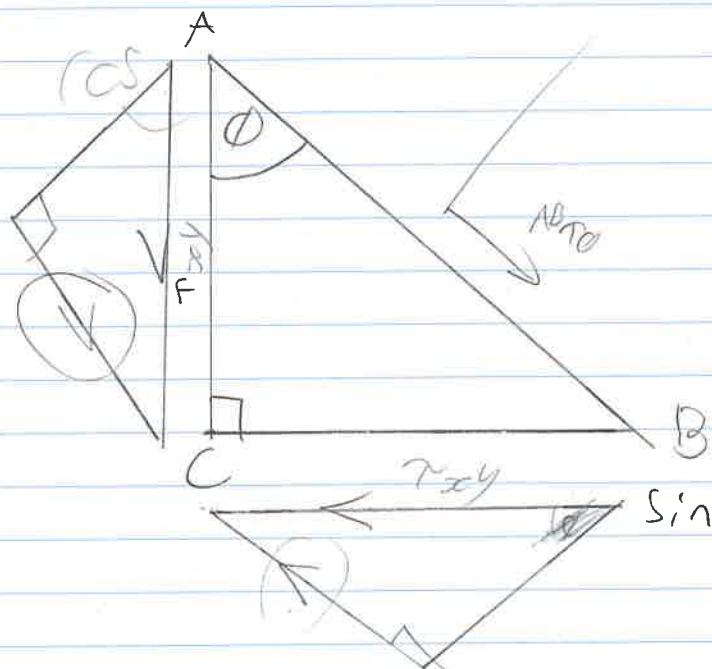
$$\begin{aligned} S &= \frac{\sigma}{H} \\ C &= \frac{A}{H} \\ T &= \frac{\sigma}{A} \end{aligned}$$

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

$$\begin{aligned} \sigma_{\theta} &= \tau_{xy} \sin \theta \cos \theta + \tau_{xy} \sin \theta \cos \theta \\ \sigma_{\theta} &= 2 \tau_{xy} \sin \theta \cos \theta \end{aligned}$$

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

$$\begin{aligned} \sigma_{\theta} &= \frac{2}{2} \tau_{xy} \sin 2\theta \\ \sigma_{\theta} &= \tau_{xy} \sin 2\theta \end{aligned}$$



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

$$AB \tau_{\theta} = \tau_{xy} \overset{BC}{AC} \sin \theta - AC \tau_{xy} \cos \theta$$

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

$$\tau_{\theta} = \sin \theta \times \sin \theta \tau_{xy} - \cos \theta \times \cos \theta \times \tau_{xy}$$

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

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

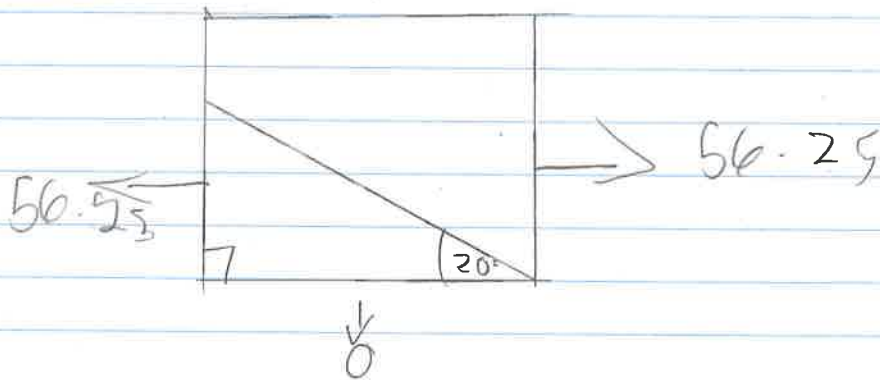
$$-\cos 2\theta = (\sin^2 \theta - \cos^2 \theta)$$

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

$$C \quad A = 0.8 \text{ m}^2$$

$$F = 45 \times 10^3$$

$$\sigma_x = \frac{45 \times 10^3}{0.8} = 56.25 \text{ UNITS?}$$



$$\sigma_y = 0$$

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

$$\sigma_\theta = \frac{1}{2}(56.25 \times 10^3) + \frac{1}{2}(56.25 \times 10^3) \cos 2(20)$$

~~$$\sigma = 28.146 \text{ kNm}^{-2}$$~~

~~$$\tau_\theta = \frac{1}{2}(56.25 \times 10^3)$$~~

$$\sigma_\theta = 49.67 \text{ kNm}^{-2}$$

/ UNITS

$$\tau_\theta = \frac{1}{2}(56.25 \times 10^3) \sin 2(20)$$

$$\tau_\theta = 18.08 \text{ kNm}^{-2}$$

/ UNITS

Q3 a a design problem is a problem that arises when planning a problem arises, this means there are normal many solutions to this problem - an analysis problem is one problem with only one single solution. / (3)

b with a design problem normal the error can not be solved in one day. For exam if a novice designer handed ~~doing~~ their complex C-Pilers on a car, it most likely could be done so the work would be sent back to be changed. a analysis problem is sequential as only one of these problem can be solve at a time, for exam maxum load of a vehicle, weight must be add sequential till it is found. / (1)

c firstly there was the French method from around 1895 what Wien was a linear method for solving a problem. then there was the Phil and bas method from the late 1990s where more focus was placed on computer aided design. the modern Chris lead to the British Standard Part 2 which has a major focus on computer aided design.

→ Next Page

they all follow a basic pattern
the which is, first identifying the
problem the consumer has, researching
the competition, then a general solving.
This leads to a single solution which
is then tested and evaluated.

(5)

Question No.

Examiner O

Arholwr yn unig

y Cwestiwn

Question No.

Examiner Only

Arholwr yn i

Rhif y Cwestiwn

Question No.

Examiner O

Arholwr yn unig

y Cwestiwn



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) !

3. Rhaid i'r atebion fod mewn llawysgrifen ddarllenadwy. Gall yr Arholwyr naili ai anwybyddu sgrïp't annarllenedadwy, 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 fras nodiadau yn y llyfr atebion a thynnu llinell drwyddyt.

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 gwyllywr/gwyllyr.

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	Tell y Papur Arholiad	
1	Rhif Myfyriwr	

[illegible]

(See the other side for English version)

Lienwch, plygwch a seliwch
(gweler nodyn 2 isod)

CYFENW:

ENW(AU) CYNTAF: