



Complete, fold and seal
(see note 2 below)

Payne

Peter

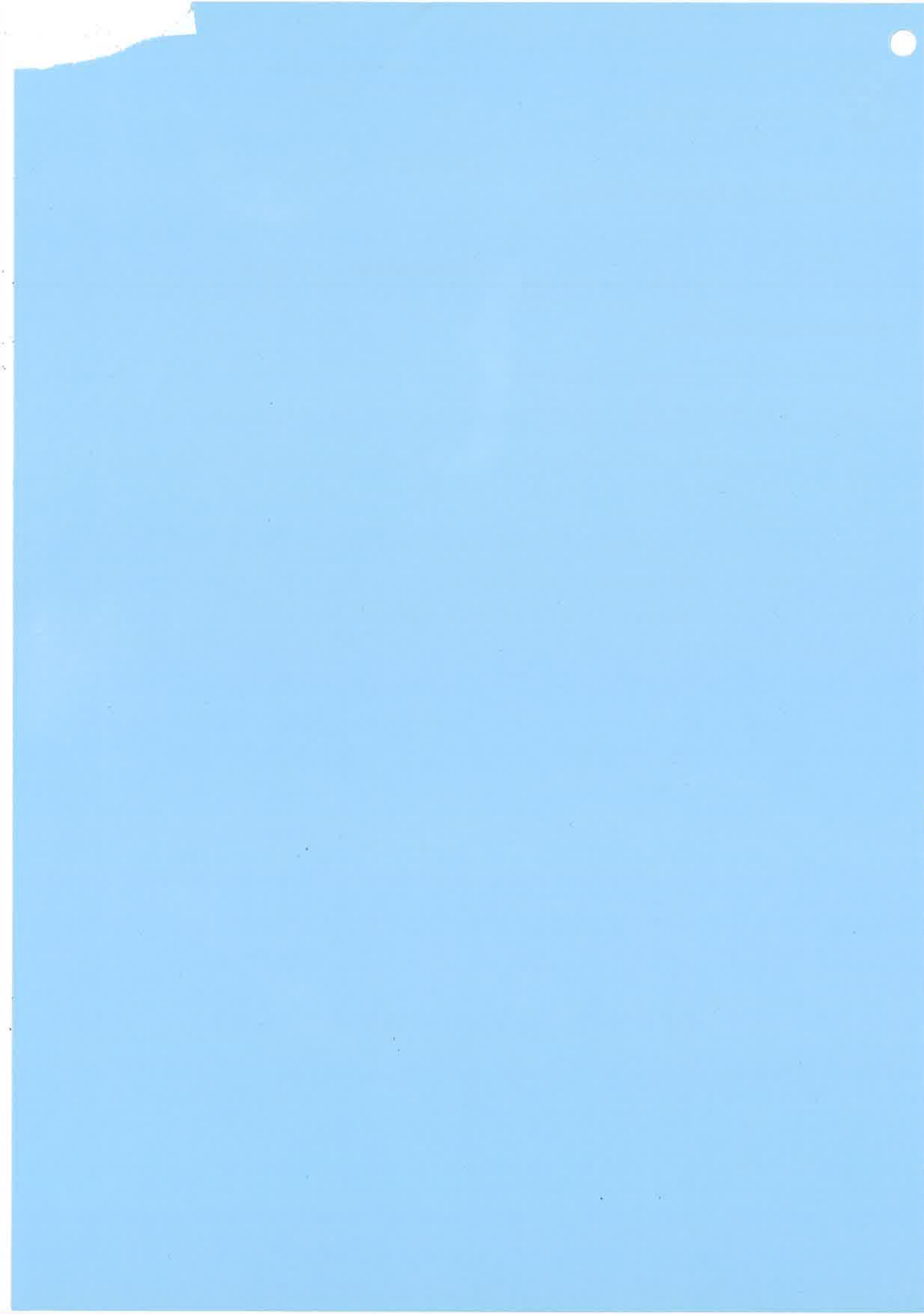
12 Pages

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 read 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.**

List the numbers of the questions you have attempted	Office Use
1	20
2	2
3	8
Total	30

(Gweler yr ochr arall am y fersiwn Cymraeg)

50



1) a) Pressure Force = PA
 $F = P d L$

Hoop Stress Force = $2\sigma_H t L$

$2\sigma_H t L = P d L$

$2\sigma_H = \frac{P d}{t}$

$\sigma_H = \frac{P d}{2t}$

b) i) at sea level: $P = 101 \times 10^3 \text{ Pa}$

$\sigma_H = 200 \times 10^6 \text{ Pa}$ $d = 3.5 \text{ m}$

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

max: $P = \frac{\sigma_H \times 2t}{d}$

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

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

from table: $57.2 \text{ KPa} \rightarrow 15000 \text{ Ft}$

$101 \times 10^3 - 57.14 \times 10^3$
 $= 43.86 \times 10^3 \text{ Pa}$

max Altitude = 20000 ft

ii) Pressure at 8000 ft = 75.3 Kpa

$$75.3 - 57.2 = 18.1 \text{ Kpa}$$

Max altitude if pressurized at 8000 ft
= 40000 ft.

c) ~~Pressurizing plane cabins~~

Narrative written by amonensis Ps.

Pressurizing plane cabins allows the plane to be flown at a higher altitude without exceeding the maximum hoop stress. In turn this flying at a higher altitude increases fuel efficiency as the air is less dense resulting in less drag/air resistance.

d) $F = PA$

Pressure Force = $P \pi d$

$$\text{Hoop } F = \sigma_H \frac{\pi d^2}{4t}$$

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

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

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

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

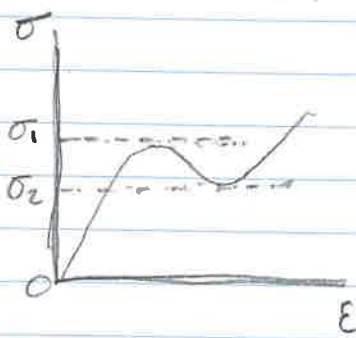
e) Amovensis - PS.

~~Cylindrical containers have a higher volume capacity in terms of their overall footprint however spherical tanks are able to store fluids at a much higher pressure.~~

Cylindrical containers are more economical as they are able to store a greater capacity of fluid within a smaller overall footprint. However, spherical tanks are able to store fluids at a much greater pressure, which is ideal for storing pressurised gases.

13

2) a)

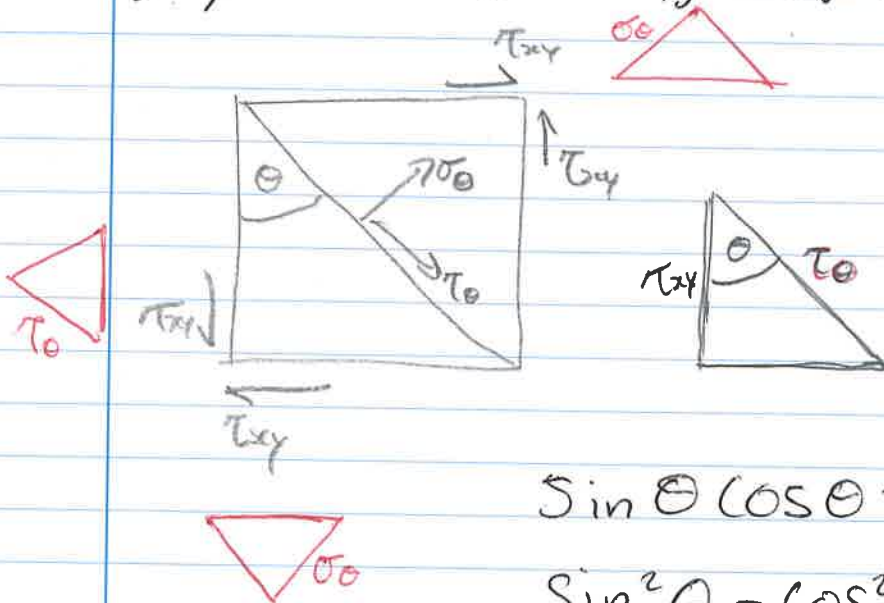
 $\sigma_1 = \text{max Principal Stress}$ $\sigma_2 = \text{min Principal Stress.}$

Amovensis - Ps.

Principal stress is the maximum amount of

(σ_1) maximum principal stress ^{denotes} is the maximum amount of force ^{an} object / material can undergo elastically before any plastic deformation occurs. Principal plane is the angle / direction in which a force is applied to an object / material.

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



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

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

3) a) An overview: P.

A design problem generally has many solutions eg: if one was to be tasked with designing a chair there are many possible solutions that would ~~st~~ satisfy the design ~~criteria~~ ^{criteria}. However, an analysis problem would be less broad. for example when analysing a design proposal for said chair the problem would be as simple as does the chair function as desired or not.

3

b)

Design problems are normally iterative because there can potentially be a number of ~~solutions~~ potential solutions that can solve the problem. So it is common for many iterations of designs proposals are assessed before the final solution is found. On the other hand analysis problems are more often than not sequential as it is common that ~~just~~ ^{just} a single problem ~~solution~~ ~~element~~ solution is to be analysed. This is normally in the form of a sequence of analytical techniques to establish the performance and/or suitability of said solution.

5

Question No.

Examiner Only

Rhif y Cwestiwn

Arholwr yn unig

Question No.

Examiner On

Arholwr yn unig

rhif y Cwestiwn

Question No.

Examiner Only

Arholwr yn unig

3rdd y Cwestiwn

Question No.

Examiner Only

Arholwr yn unig

Rhif y Cwestiwn

Question No.

Examiner On

Arholwr yn unig

thif y Cwestiwn

Cyfarwyddiadau i Ymgeiswyr

1. Rhwch yr holl wybodaeth y gofynnir amdani yn y blychau isod.
2. Rhwch eich enw yn y lle a ddarparwyd ar y dde, plynwch ef a'i selio i lawr (gan ddefnyddio'r label a ddarparwyd) i guddio'ch enw.

3. Rhaid i'r atebion fod mewn llawysgrifedd arall. Gall yr Arholwyr naill ai anwybyddu sgrifft annarllenadwy, 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 tras 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 gwyllylwr/gwylwyr.

8. Rhaid dychwelyd pob llyfr. Ni chanafeir mynd â llyfrau atebion, wedi eu defnyddio neu heb eu defnyddio, allan o'r lleoliad arholi o dan unffyw amgylchiadau.

[illegible]

(See the other side for English version)

Llenwch, plygwrch a selwch
(gweler nodyn 2 isod)

CYFENN:

ENW(AU) CYNTAF:

ENW(AU) CYNTAF: