



Complete, fold and seal
(see note 2 below)

Lord

Over

Lydon

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)

11.7



3

a) Design Problem -

A Design Problem has broad initial brief with a relatively vague set of goals based around an overall aim. Design problems are solved using an iterative solution process.

Analysis Problem -

An Analysis problem has a clear, well defined goal. The initial brief will include specific goals and problems within the overall task. Analysis problems use a sequential solution process.

b) A design problem uses an iterative solution process as the method of solution requires a "back-and-forth" style of optimisation whereby each iteration is critiqued and analysed before being developed into a further iteration that better meets the design/problem brief. Each iteration is, in theory, an improvement upon the previous until an acceptable design is reached.

An Analysis problem uses a more linear/sequential process of solution as the problem has a clear, well-defined conclusion such as "Find the cause of component failure during frontal loading under the following conditions...". The descriptive nature of the initial brief allows the engineer to take a step-by-step process of elimination approach to the problem such as; "Is the failure material based?", "Does the component have areas of high stress/strain that contribute to the failure?" etc.

c) The Five Step design Process Model

1. Define the Problem
2. Gather Relevant Information
3. Generate Multiple Solutions
4. Analyse and Select a Solution
5. Test and Implement a Solution.

1. Defining the Problem -

Outlining the key areas of importance.
Prescribing Boundaries and limitations of the problem/process.

2. Gather Relevant Info -

Market research; looking at competitor products, competitor costing, methods of solving the same problem, etc.

3. Generate Multiple Solutions -

Brainstorming ideas to generate a pool of solutions from which to select promising ideas.
Involving participants from multiple backgrounds to provide a wider ideabase and to encourage lateral/non-traditional approaches to a problem.

4. Analyse and Select a Solution -

Narrow down applicable solutions by testing with specific criteria such as; Ergonomic Analysis, Strength and Materials testing, Market comparisons, Performance analysis etc.

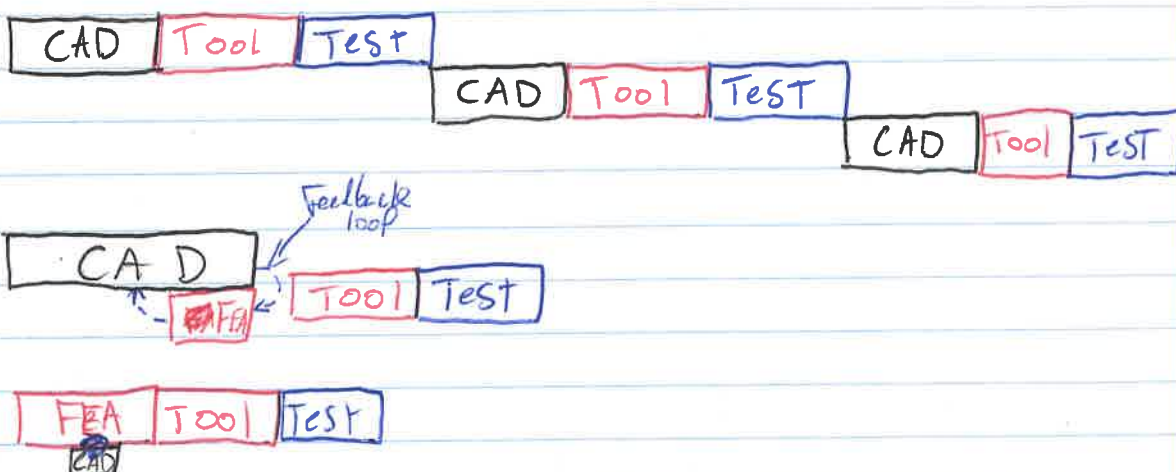
3c
Cont.

S. Test and Implement a Solution -

Test the Selected Solution against the initial design Problem.

Implement the Solution with prototypes, Patents etc.

(3)



X

b)

X

c)

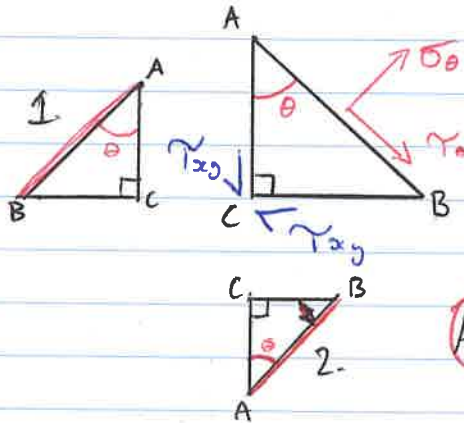
X

2

a) ~~Find the stress components σ_θ and $\tau_{\theta\theta}$ in a triangular element ABC, where θ is the angle between the hypotenuse AB and the vertical side AC.~~

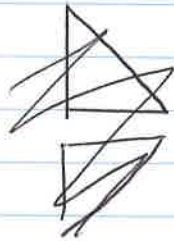
b)

i)

S^oH C^oH

$$\sigma_\theta \sin 1 = \sigma_x \cos \theta$$

$$AB = \sin \theta \tau_{xy}$$



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

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

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

Question No.

Examiner

Arholwr yn unig

Owestiwn

Question No.

Examiner

Arholwr yn unig

y Cwestiwn

Question No.

Examiner Only

Question No.

Examiner C

Arholwr yn unig

y Cwestiwn

Question No.

Examiner Only

Question No.

Examiner

Arholwr yn unig

Cwestiwn



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 iello i lawr (gan ddefnyddio'r label a ddarparwyd) i guddio'ch enw.

3. Rhaid i'r atebion fod mewn llawysggrifen 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 fras 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 gwyllwyr/gwilyr.
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.

1	Rhif Myfyrwr	
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	

[illegible]

(See the other side for English version)

Llenwch, plynwch a seliwch
(gweler nodyn 2 isod)

CYFENN:

ENW(AU) CYNTAF:

ENW(AU) CYNTAF: