



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.**

1	Student Number	1504426
2	Title of Examination Paper	Advanced Stress & FEA
3	Module Code	M6X00420
4	Date and Time of Examination	31/01/2020
5	Examination Venue	
6	Seat Number	
7	Number of Answer Books handed in	

Complete, fold and seal
(see note 2 below)

SURNAME:

WARD

FORENAME(S):

DANIEL

IAN

List the numbers of the questions you have attempted	Office Use
1	7
2	10
3	3
Total	20

33.3%

The first part of the paper discusses the importance of the study of the history of the English language. It is a branch of linguistics which deals with the changes in the language over time. The second part of the paper discusses the importance of the study of the history of the English language. It is a branch of linguistics which deals with the changes in the language over time. The third part of the paper discusses the importance of the study of the history of the English language. It is a branch of linguistics which deals with the changes in the language over time.

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Q 1

- a) ~~Strain~~ Strain energy is the energy produced when an object is ~~not~~ loaded and is defined as the change in length divided by its original length.

X 0

b) $E = \frac{\sigma}{\epsilon}$ $\delta = \frac{Pds}{AE}$

$$\sigma = PA$$

~~$$E = \frac{\sigma}{\delta}$$~~

$$E = \frac{\sigma}{ds}$$

~~$$E = \frac{P}{A} \frac{\delta}{ds}$$~~

~~$$E = \frac{PA}{\delta}$$~~

~~$$E = \frac{P}{\delta}$$~~

~~$$E = \frac{P}{A} \frac{\delta}{ds}$$~~

~~$$E = \frac{P}{A} \frac{\delta}{ds}$$~~



$$E = \frac{Pds}{AS}$$

$$\Rightarrow \delta = \frac{Pds}{AE}$$

/ 2

c)

~~$$\delta = \frac{Pds}{AE}$$~~

~~$$U = \frac{P^2 L}{2AE}$$~~

~~$$U = \frac{1}{2} P \delta$$~~

$$\delta = \frac{Pds}{AE}$$

$$U = \frac{P^2 L}{2AE}$$

$$U = \frac{1}{2} P \delta$$

$$U = \frac{1}{2} P \delta$$

$$\therefore U = \frac{P^2 L}{2AE}$$

~~$$U = \frac{P^2 L}{2AE}$$~~

+ 1

- d) Resilience is used to determine how much Force or pressure a material ~~can~~ can with stand

X 0

Q1 e/

~~rest of the~~ $\sigma = \frac{P}{A}$

~~W = N/A~~

~~S =~~

~~$r = \frac{\sigma}{E}$~~

~~$\delta = \frac{\sigma}{E}$~~

~~$\sigma = \frac{P}{A}$~~

~~$E = \frac{\sigma}{\delta}$~~

~~$U = \frac{P^2 L}{2AE}$~~

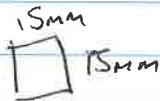
~~$W = N/A$~~

~~$\delta = \frac{P \delta s}{AE}$~~

~~$r =$~~

X 0

F/



~~$L = 1m$~~

~~$E = ?$~~

~~$\sigma = 200 \text{ MPa}$~~

~~$A = 225 \times 10^{-6}$~~

~~$U = \frac{P^2 L}{2AE}$~~

~~$\sigma = \frac{P}{A}$~~

~~$W = N/A$~~

~~$r =$~~

~~$P = 200 \times 10^6$~~

~~$P = 200 \times 10^6$~~

~~$\sigma = \frac{P}{A}$~~

~~$P = \sigma \times A$~~

~~$P = 200 \times 10^6 \times 225 \times 10^{-6}$~~

~~$P = 45 \times 10^6 \text{ N}$~~

~~$U = \frac{(45 \times 10^6)^2 \times L}{2 \times 225 \times 10^{-6} \times E}$~~

~~$E =$~~

~~$\therefore UE = 100 \times 10^9 \text{ Pa}$~~

~~$\delta = \frac{P \delta s}{AE}$~~

~~$U = \frac{100 \times 10^9}{1}$~~

~~$200 \times 10^6 \times 1 = \frac{45 \times 10^6 \times 1}{225 \times 10^{-6} \times E}$~~

~~$E = \frac{45 \times 10^6}{225 \times 10^{-6} \times 200 \times 10^6}$~~

~~$U = 100 \times 10^9 \text{ Pa}$~~

~~$E = 1$~~

~~$E = 1$~~

4

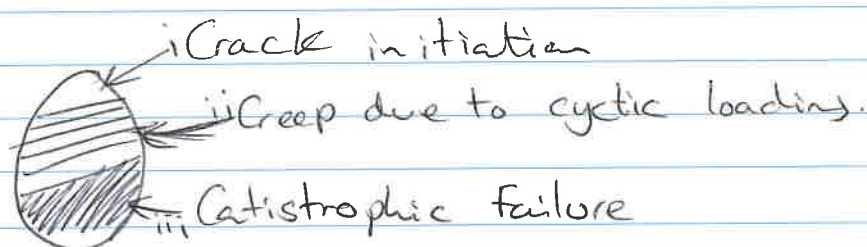
22a

~~Marked~~Fatigue ⁴ Crack initiator's are:

- Stress raisers in designed component
~~Material~~ - Sharp edges in the design
- Material defects
 - Surface cracks and sub surface defects
- ~~Damage~~ Corrosion - Environments may materials to erode or ~~split~~ delaminate

3

b)



3

i). The initial crack may appear due to causes discussed in part a).

ii) over time the crack widens due to cyclic loading.

iii) The ~~crack~~ Part Fails as its no longer capable of supporting its load.

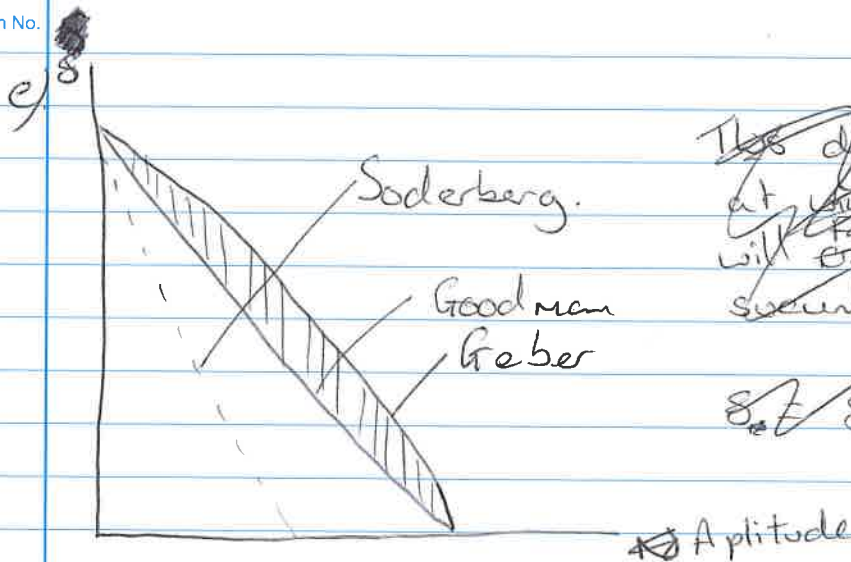
$$d) \sigma_r^a N_f = k$$

$$k = \sqrt{\quad}$$

$$N_f = 10^9 \quad \sigma_r = 100 \text{ MPa}$$

$$N_f = 10^6 \quad \sigma_r = 200 \text{ MPa}$$

D



~~This diagram shows~~
~~at which point a component~~
~~will fail under specific~~
~~circumstances.~~

$$\sigma = \sigma_n \left[\frac{\sigma_a}{\sigma_n} \right]$$

The actual stress area where a component would fail would be in the shaded area but designers prefer Soderberg as it provides a degree of safety factor

Soderberg, Goodman and Gerber all produced formulas which described how the amplitude of stress of a material affected its the number of cycles it could be loaded.

$$\sigma = \sigma_n \left[\frac{\sigma_a}{\sigma_n} \right]$$

/

4

Q 3

a) When Meshing a model the quality of the mesh is important because ~~the~~ meshing determines how the calculations are made. ~~and therefore~~

~~the mesh should~~

~~run through the~~

~~group~~

~~the~~

~~material~~

~~properties~~

~~increase~~

~~help~~

~~the~~

~~quality.~~

~~They include:~~

~~• adding radius features to hard~~

~~edges.~~

~~• Removing unnecessary features.~~

Meshes which run along solid angles ~~will~~ give results which are very much higher to what may be acceptable / true.

A number of things can be done to improve ~~increase~~ help the quality.

They include:

- adding radius features to hard edges.
- Removing unnecessary features.

3

Q3b) Destructive and Non destructive tests are used to verify results.

Destructive tests include tensile test.

~~Both of which~~ ^{This} tests a materials properties ^{Address tests} under loading and by loading ~~the~~ ^{the} samples until Failure.

A model is then run under Static ~~loading~~ Analysis and compared to the physical test to determine its plausibility.

Question No.

Examiner O

Arholwr yn unig

if y Cwestiwn

Question No.

Examiner Only

Question No.

Examiner On

Arholwr yn unig

nif y Cwestiwn

Question No.

Examiner Only

Arholwr yn un

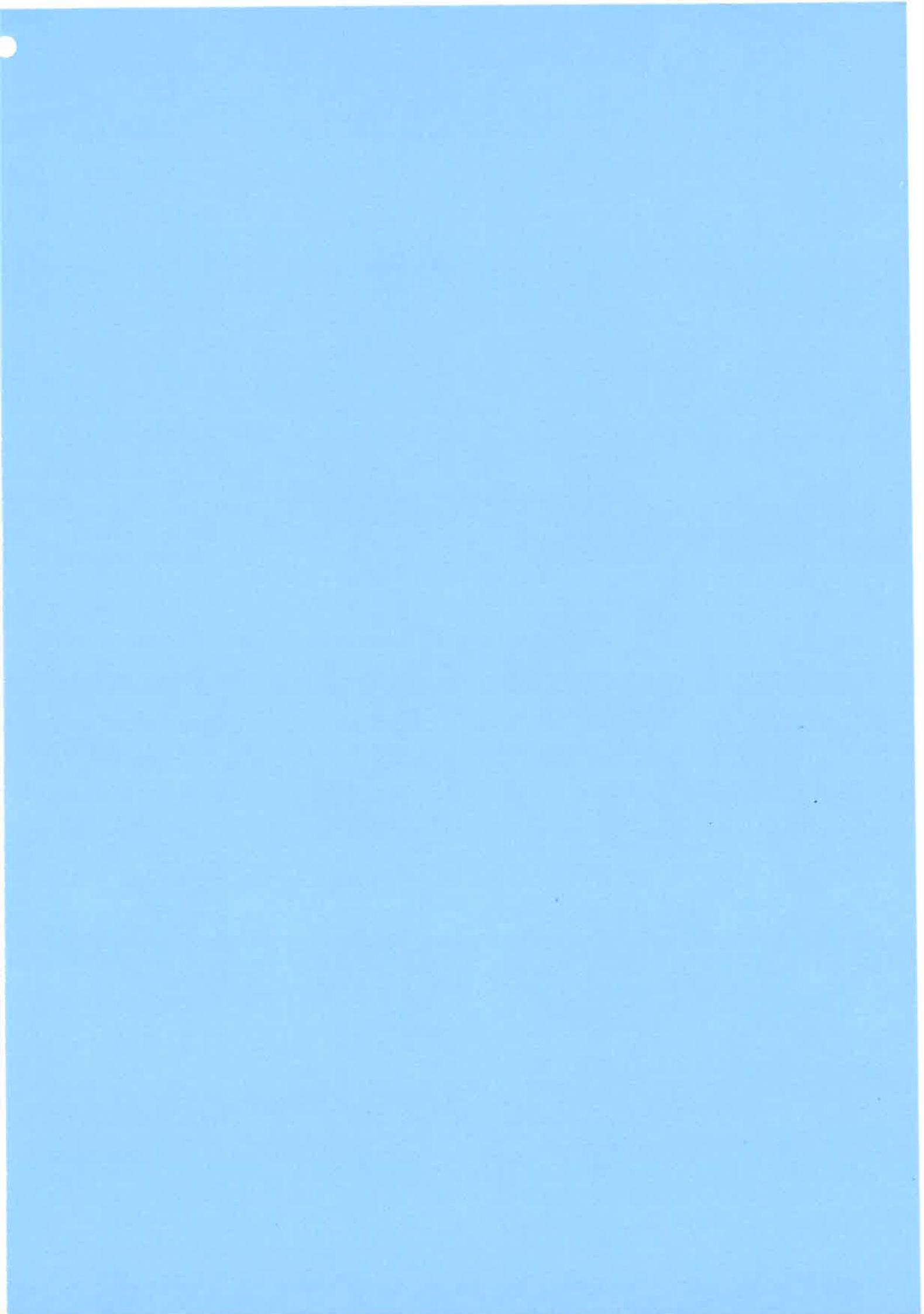
Rhif y Cwestiwn

Question No.

Examiner Or

Arholwr yn unig

hif y Cwestiwn



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 Myfyrwr	

[illegible]

(See the other side for English version)

Lienwch, plygwch a seliwch
(gweler nodyn 2 isod)

CYFENN:

ENW(AU) CYNTAF: