



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	1810328
2	Title of Examination Paper	Scientific Principles of OME Design
3	Module Code	ACAD 6008
4	Date and Time of Examination	11:00 5/5/2022
5	Examination Venue	Libry 001
6	Seat Number	
7	Number of Answer Books handed in	1

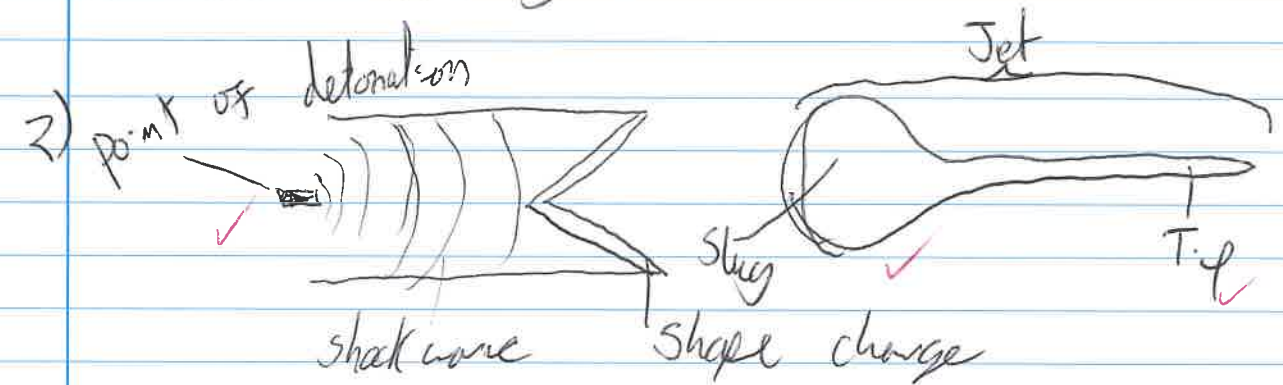
List the numbers of the questions you have attempted	Office Use
1	1
2	4
3	0
4	2
5	0
6	2
7	20
8	5
Total	34

1) The target ~~the~~ The material it is hitting
concrete or steel

Q1
=1

The material of the warhead
Thick ness of casing
The velocity of the warhead
Type of explosive

2) Material of the casing and how
thick.
Using $\frac{1}{2}$ preformed fragments
Notched casing



When the explosives in a shape charge
is detonated, a shock wave travels to
the point of the comb. This is
then inversed to form a hydrodynamic
jet that can be 8-12 $\frac{1}{2}$ length of
the comb. The jet is traveling at
such high temperatures and velocities
it pushes aside the target material.
The jet propelled can be affected
by the type of material it is
made of, the explosive used and
how densely packed it is.

A tank can defend itself from a shaped charge attack by:

• Explosive reactive armour to disrupt the formation of the jet ✓

• Spaced armor ✓

• Caged armour that has the same stand as ✓

However a warhead with two SL can overcome the reactive armour, as one SL becomes sacrificial ✓

3)

$$A = F \cdot M$$

$$A = 350 \times 40 = 14000 \text{ km}^3$$

$$M = \frac{E}{A} \quad M =$$

Q2
= 4

Q3
= 0

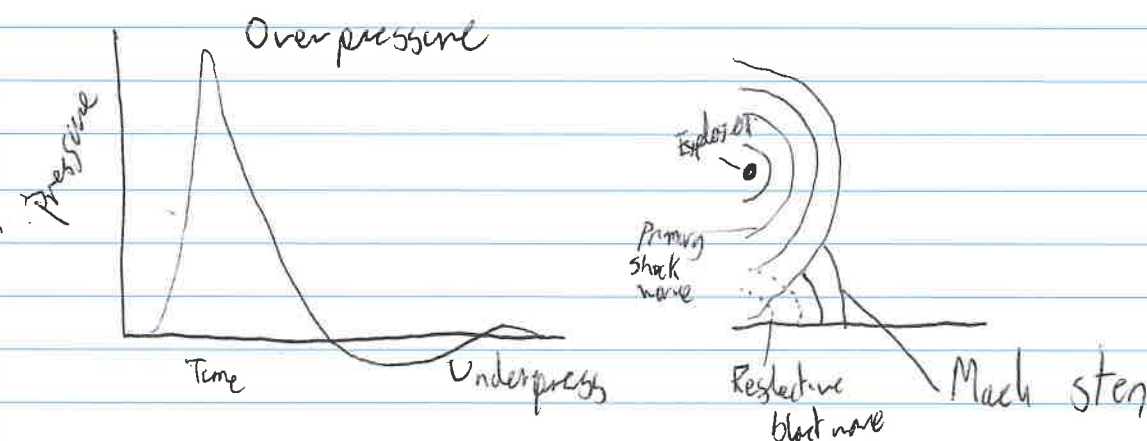
4) The blast is omnidirectional (it goes in all directions) ✓

The density of the press explosives and voids

Q4
= 2

Adding aluminium to an explosive understate increases the size of the blast and the duration of the blast. ✓

5)



Q5
= 0

6) Ballistic life is the safe storage time of a propellant before the ~~auto~~ NC is broken down and a reaction occurs.

The amount of NC ✓
The stabilisers ✓

Q6
=2

7a) To ~~attach~~ an aircraft

There are two ways to attach an aircraft: These include fragmentation or blast warhead ^{KE?}

A blast warhead needs to penetrate the aircraft, as at altitude ~~due to~~ the density of air the blast wave does not travel ~~as~~ as far as it would at sea level. ✓

Fragmentation warhead are more ~~effective~~ ^{efficient} at targeting aircraft due to the spread and speed of the fragments. ✓ Fragments are able to hit multiple components within the aircraft that are vital to keeping it in the air.

Fragment can be formed using three techniques

Naturally - the case breaks apart naturally. This uses more explosive energy and requires a larger explosive mass. The fragment size ~~is~~ ^{is} also random.

Notches - Putting ~~cuts~~ ^{notches} or cuts in the casing ~~also~~ allows the casing to break apart easier.

Preformed fragments eg. ball ~~or~~ disks allows the manufacturing of the fragments to be known thus the fragments will be the same size and density. (cont.)

76) The most effective way to target a submarine underwater requires either a blast or a shaped charge warhead.

A SC warhead is effective against a submarine as it can punch through the hull of the vessel. Ships and subs have conical keel bulbheads, when one gets ruptured it can take on water and get sealed off from the rest of the sub. Therefore several of these will need to be breached. A SC followed by a blast could deliver this effect.

This type of warhead requires a direct hit. However for a single blast warhead ~~it~~ underwater does not require it to be directly hit. When a blast occurs underwater the gases formed create a bubble effect. The bubble expands and contracts several times. Each time the bubble contracts another shock wave is released. This oscillating bubble causes the metal hull on the sub to bend, putting stress on vital joints and components. The optimum strike on a sub is ~~to~~ under watch, as the bubble tries to rise to the surface.

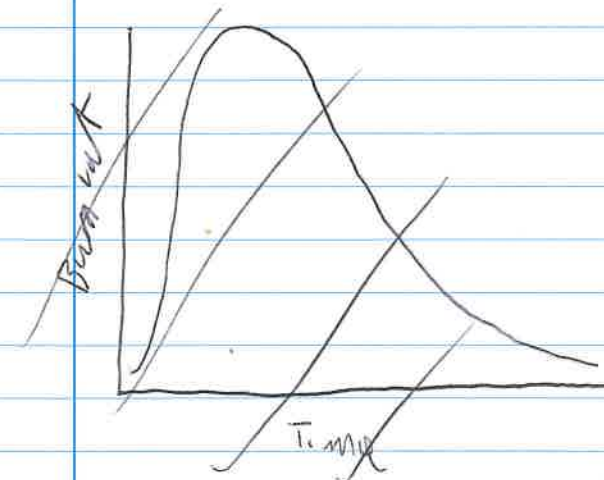
* This is because the blast wave from the explosion can travel further than it can on land, as water is less compressive. The blast wave is also able to reflect off the surface and

~~sea bed~~ sea bed.

In contrast

Another option for fragmentation is continuous long rod. Long metal rods are welded at one end and line the casing of the warhead. When detonated, they form a scorching object and are able to cut through part of the plane. However these ~~require~~ do not travel as far as smaller fragments.

8a) sphere Types of Grain



Regressive - The surface area decreases as the burn goes on

Progressive - The surface area increases

Q7
= 20
(9+11)

Q8 = 5

Question No.

P. roto law

Valles' law

$$r = \beta p^\alpha$$

β = Run ~~rate~~ rate coefficient

p = pressure

α =

Examiner Only

Question No.

Examiner Only

Arholwr yn unig

Rhif y Cwestiwn

Arholwr yn unig

Rhif y Cwestiwn