



ATAR course examination, 2019

Question/Answer booklet

AVIATION

Please place your student identification label in this box

WA student number: In figures

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In words

Time allowed for this paper

Reading time before commencing work: ten minutes

Working time: two and a half hours

Materials required/recommended for this paper

To be provided by the supervisor

This Question/Answer booklet

Multiple-choice answer sheet

Number of additional
answer booklets used
(if applicable):

To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: non-programmable calculators approved for use in this examination, navigation plotter (or ruler and protractor), flight computer

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised material. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Structure of the examination

The Aviation ATAR course examination consists of a written component and a practical (performance) component.

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of written examination
Section One Multiple-choice	20	20	30	20	20
Section Two Short answer	28	28	120	125	80
Total					100

Instructions to candidates

1. The rules for the conduct of the Western Australian external examinations are detailed in the *Year 12 Information Handbook 2019*. Sitting this examination implies that you agree to abide by these rules.

2. Answer the questions according to the following instructions.

Section One: Answer all questions on the separate Multiple-choice answer sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. Do not use erasable or gel pens. If you make a mistake, place a cross through that square, then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Section Two: Write your answers in this Question/Answer booklet.

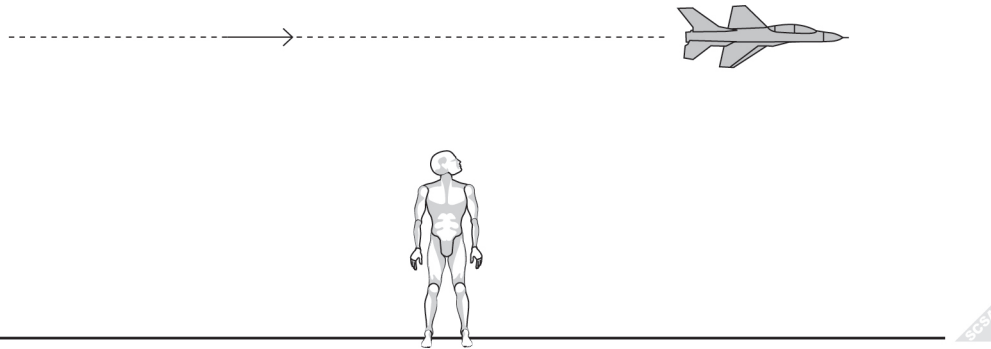
3. Working or reasoning should be shown clearly when calculating or estimating answers.
4. You must be careful to confine your answers to the specific questions asked and to follow any instructions that are specific to a particular question.
5. Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

Section One: Multiple-choice**20% (20 Marks)**

This section has **20** questions. Answer **all** questions on the separate Multiple-choice answer sheet provided. For each question shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. Do not use erasable or gel pens. If you make a mistake, place a cross through that square, then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Suggested working time: 30 minutes.

1. An aircraft travelling at Mach 1.5 flies over an observer, producing a sonic boom.



- The observer hears the sonic boom when the
- edge of the shock wave crosses their location.
 - front of the shock wave and the aircraft are directly overhead.
 - front of the shock wave has reached the ground and reflected to their location.
 - edge of the shock wave has passed their location by exactly 2.9 seconds.
2. In a pressurised aircraft, what altitude is generally considered to be the critical cabin altitude above which flight crew should wear oxygen masks?
- 8000 ft
 - 10 000 ft
 - 15 000 ft
 - 18 000 ft
3. An aircraft is lined up on Runway 35. If the wind is 070° M/15 kt, the aircraft will experience
- headwind and crosswind from the right.
 - headwind and crosswind from the left.
 - tailwind and crosswind from the right.
 - tailwind and crosswind from the left.

See next page

4. Symptoms of an oncoming loss of consciousness due to G-forces (G-LOC) include
- (a) pain in the ears and sinuses.
 - (b) fast breathing.
 - (c) slow breathing.
 - (d) tunnel vision.
5. Which one of the following statements describes correctly the **most** likely effects of exposure, over a long period of time, to high levels of environmental noise?
- (a) Some loss of hearing may occur, but it lasts only briefly after exposure.
 - (b) Some loss of hearing may occur, but total recovery will eventually take place.
 - (c) Some loss of hearing may occur, but partial recovery will eventually take place.
 - (d) A permanent loss of hearing may occur.
6. A person experiencing pain in the joints and severe headache is **most** likely to be encountering symptoms of
- (a) carbon monoxide poisoning.
 - (b) hyperventilation.
 - (c) decompression sickness.
 - (d) hypoxia.
7. Which one of the following communication styles will an effective captain use with their co-pilot?
- (a) assertive and submissive
 - (b) assertive and supportive
 - (c) aggressive and supportive
 - (d) supportive and submissive
8. To **best** overcome the effects of spatial disorientation, a pilot should
- (a) rely on their aircraft's instrument indications.
 - (b) slow their breathing rate.
 - (c) increase their breathing rate.
 - (d) rely on their body sensations.
9. The number of lights used as part of a standard T-VASIS is
- (a) 4.
 - (b) 6.
 - (c) 8.
 - (d) 10.

10. The factor **most** likely to cause an overall reduction in the impact of aircraft noise at existing airports in the future is
- (a) government regulation.
 - (b) altering flight paths on the basis of GPS.
 - (c) increasing pilot training.
 - (d) moving airports to different locations.
11. Comparing a parcel of air to the surrounding air in an unstable environment, the parcel of air will be
- (a) warmer and more dense, causing descent.
 - (b) warmer and less dense, causing ascent.
 - (c) colder and more dense, causing descent.
 - (d) colder and less dense, causing ascent.
12. The saturated adiabatic lapse rate per 1000 feet is closest to
- (a) 1.5 °C.
 - (b) 2.0 °C.
 - (c) 2.5 °C.
 - (d) 3.0 °C.
13. A METAR is a
- (a) special aerodrome weather report issued when certain criteria are met.
 - (b) routine aerodrome weather report issued at half-hourly intervals.
 - (c) three hour trend forecast.
 - (d) statement of meteorological conditions expected for a period of time within five nautical miles.
14. A SIGMET provides information regarding
- (a) any cloud below 5000 feet AMSL.
 - (b) wind forecast above 35 knots.
 - (c) severe icing.
 - (d) any form of cumulus cloud.
15. On a synoptic chart, in the Southern Hemisphere winds around a low pressure system will flow
- (a) anticlockwise and be strongest with further spaced isobars.
 - (b) anticlockwise and be strongest with close isobars.
 - (c) clockwise and be strongest with close isobars.
 - (d) clockwise and be strongest with further spaced isobars.

16. The abbreviation 'NCD' in relation to aviation meteorology stands for
- (a) nil cloud detected.
 - (b) no correct direction.
 - (c) nimbostratus cloud detected.
 - (d) no current direction.
17. In a period of four hours, the Earth rotates through
- (a) 15° longitude.
 - (b) 60° longitude.
 - (c) 15° latitude.
 - (d) 60° latitude.
18. A VFR aircraft is tracking 140° M. Based on hemispherical rules, at what altitude should the pilot plan to fly?
- (a) 4000 ft
 - (b) 4500 ft
 - (c) 5000 ft
 - (d) 5500 ft
19. The main disadvantage of EFIS displays is
- (a) less accurate information.
 - (b) pilot information overload.
 - (c) limited availability of information.
 - (d) increased maintenance requirements.
20. Calibrated airspeed is
- (a) the same as indicated airspeed.
 - (b) indicated airspeed corrected for density and temperature.
 - (c) indicated airspeed corrected for position error.
 - (d) indicated airspeed corrected for instrument and position error.

End of Section One

See next page

Section Two: Short answer**80% (125 Marks)**

This section has **28** questions. Answer **all** questions. Write your answers in the spaces provided. Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

Suggested working time: 120 minutes.

Question 21**(4 marks)**

There are two types of stability considered to act in all directions on an aircraft. Name and outline each of them.

One: _____

Two: _____

Question 22**(4 marks)**

As part of their normal operational duties, pilots employ countermeasures to keep threats, errors and undesired aircraft states (UAS) from reducing margins of safety in flight operations.

List **two** countermeasures pilots employ and outline the reason why each is used.

One: _____

Two: _____

See next page

Question 23

(2 marks)

State the purpose of speed brakes and the effect they have on the aerodynamics of an aircraft.

Question 24

(6 marks)

Situational awareness (SA) requires the pilot to be switched-on to an existing situation and to be focused on what is happening. Describe how the following **three** areas encompass SA.

Geographic awareness: _____

Climatic awareness: _____

Self awareness: _____

Question 25

(3 marks)

List **three** methods a pilot can use to avoid air sickness while flying.

One: _____

Two: _____

Three: _____

Question 26**(5 marks)**

- (a) Label the diagram below to show the disposition of the forces acting on an aircraft in a **climb** with power during take-off. (4 marks)



- (b) What could be fitted to the leading edges of the above aircraft's wing to reduce take-off speed and improve the rate of climb? (1 mark)

Question 27**(3 marks)**

If a pilot hyperventilates, they will display symptoms of lightheadedness and tingling in the fingers. This is due to the changed carbon dioxide level in their blood.

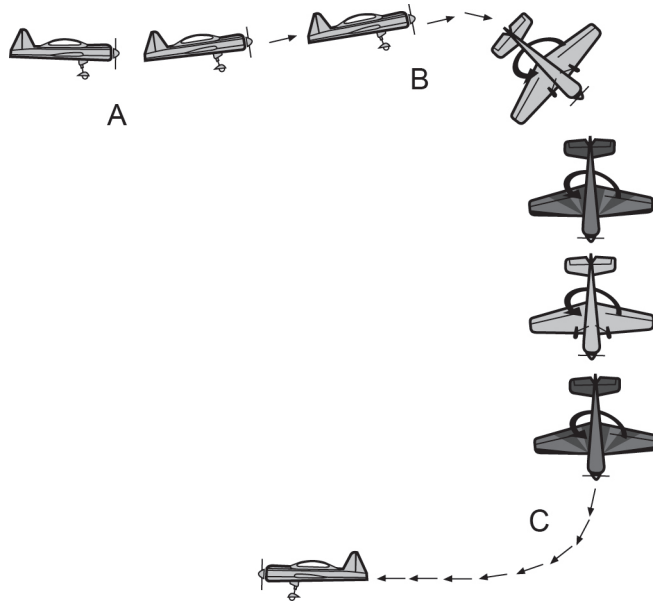
- (a) Explain how you could treat hyperventilation. (2 marks)

- (b) In treating hyperventilation, what are you trying to do to the level of carbon dioxide in the pilot's blood? (1 mark)

Question 28

(6 marks)

In the scenario below, the aircraft is flying straight and level (point A). At point B, the aircraft enters a stall. As it falls, it enters a vertical spin and rotates around its fuselage. At point C, it is recovered.



- (a) What has to occur in order for the aircraft to stall (point B)? (2 marks)

- (b) State the **four-step** procedure to recover from the spin (point C). (4 marks)

Step 1: _____

Step 2: _____

Step 3: _____

Step 4: _____

Question 29**(5 marks)**

Vision is a very important sense for a pilot. Eye deficiencies such as colour blindness and myopia can be a problem for a pilot in flying operations.

- (a) (i) Circle the colour(s) that are associated with colour blindness. (1 mark)

red orange yellow green blue indigo violet

- (ii) Identify **two** difficulties that a pilot with colour blindness can encounter in flying operations. (2 marks)

One: _____

Two: _____

- (b) Explain why myopia is a problem for a pilot if uncorrected. (2 marks)

Question 30**(3 marks)**

A precision approach path indicator (PAPI) is a visual aid that helps a pilot maintain the correct approach to a runway. Complete the table below identifying what each light array colours indicate about glide slope trajectory.

PAPI light array colours	Glide slope trajectory
four white lights	
two red lights and two white lights	
four red lights	

Question 31

(2 marks)

Given the following data:

- airfield elevation 1218 ft
- QNH 1004 hPa
- OAT 33 °C.

Calculate airfield pressure height. Show **all** workings.

Question 32

(2 marks)

Given the following data:

- airfield pressure height 1345 ft
- QNH 1025 hPa
- OAT 10 °C.

Calculate airfield density altitude. Show **all** workings.

Question 33

(3 marks)

An aerodrome's latest weather information states the dewpoint as 10 °C and the temperature as 22 °C. The aerodrome elevation is 132 ft. Using the dry adiabatic lapse rate, calculate the cloud base above sea level. Show **all** workings.

Question 34

(4 marks)

- (a) Explain the method of operation of the inertial navigation system (INS) on an aircraft.

(3 marks)

- (b) State the primary limitation of the INS on an aircraft.

(1 mark)

Question 35

(5 marks)

Automatic dependent surveillance broadcast (ADSB) is becoming more common worldwide for aviation operations.

- (a) Explain the method of operation of ADSB.

(3 marks)

- (b) State **two** limitations on ADSB.

(2 marks)

One: _____

Two: _____

Question 36

(4 marks)

Identify **four** methods by which air is forced to ascend, leading to cloud creation.

One: _____

Two: _____

Three: _____

Four: _____

Question 37

(6 marks)

Refer to the TAF extract shown below.

TAF YPKG 161018Z 1610/1706
 23018KT CAVOK
 FM161100 20010KT 9999 -RA BKN090
 FM161400 18012KT 9999 -RA BKN012
 FM161800 17014KT 9999 -RA SCT010 BKN016
 FM170200 18011KT 9999 SCT040
 TEMPO 1616/1701 2000 RA BKN006
 INTER 1701/1703 4000 SHRA BKN010
 RMK
 T 21 16 13 10 Q 1017 1018 1018 1019

(a) What time and date was the TAF issued? (1 mark)

(b) What was the forecast wind at 1015UTC? (1 mark)

(c) What is the meaning of the term TEMPO used in the forecast? (1 mark)

(d) What is the forecast QNH at 1300UTC? (1 mark)

(e) Outline the forecast cloud at 0220UTC. (2 marks)

Question 38

(5 marks)

Explain the method of operation of global navigation systems (GPS).

Question 39

(5 marks)

Flight operations and their height above any surfaces are vital to safety.

(a) In flight planning, state the purpose of:

(i) area QNH. _____ (1 mark)

(ii) QFE. _____ (1 mark)

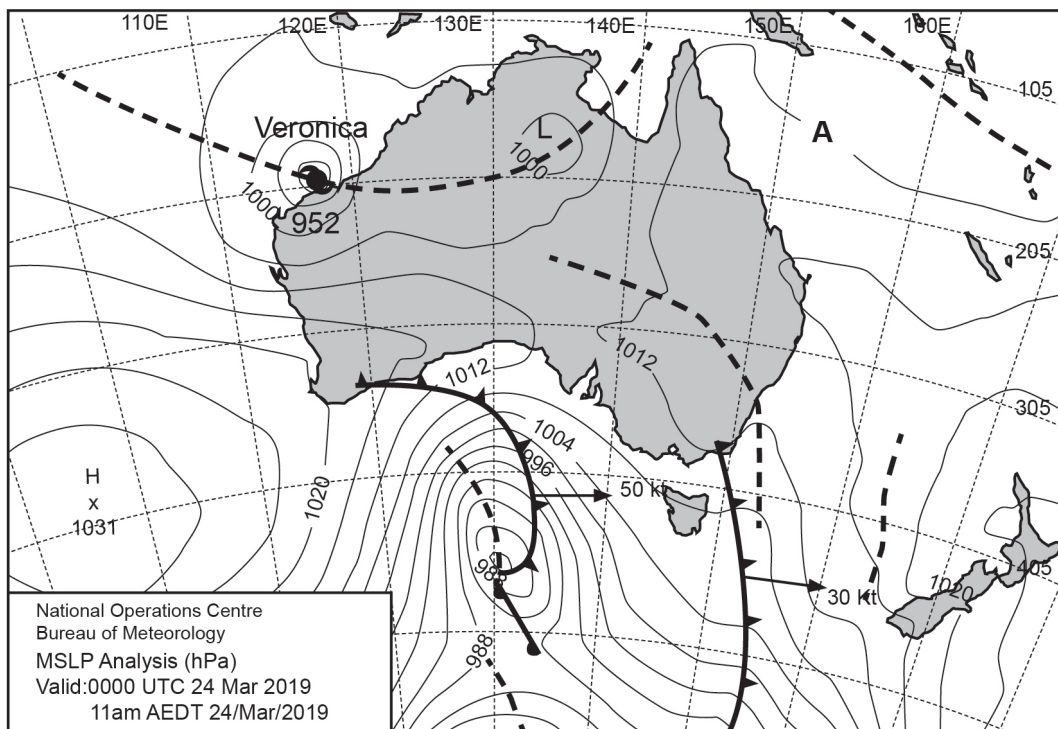
(b) Explain the relevance to a pilot in Australia of 'transition level'.

(3 marks)

Question 40

(7 marks)

On the basis of the synoptic chart below, identify the features and extract the relevant information to answer the questions below.



(a) What meteorological feature is Veronica? (1 mark)

(b) State **two** features of Veronica. (2 marks)

One: _____

Two: _____

(c) State the pressure at Position A. (1 mark)

(d) Describe the frontal system approaching the west coast of Tasmania. (3 marks)

Question 41**(4 marks)**

Aircraft noise has a significant effect on aviation operations. Identify **two** sources of aircraft noise. Outline how each of these sources has been reduced or ways in which it could be reduced.

One: _____

Two: _____

Question 42**(5 marks)**

The following data applies to an aircraft:

- required aircraft track 270° True
- prevailing wind 340° M/20 kt
- magnetic variation 10° E
- true airspeed 130 kt.

Using a flight computer, calculate:

(a) required magnetic track. (1 mark)

(b) aircraft ground speed. (1 mark)

(c) direction of aircraft drift. (1 mark)

(d) required aircraft heading. (1 mark)

(e) aircraft drift angle. (1 mark)

See next page

Question 43

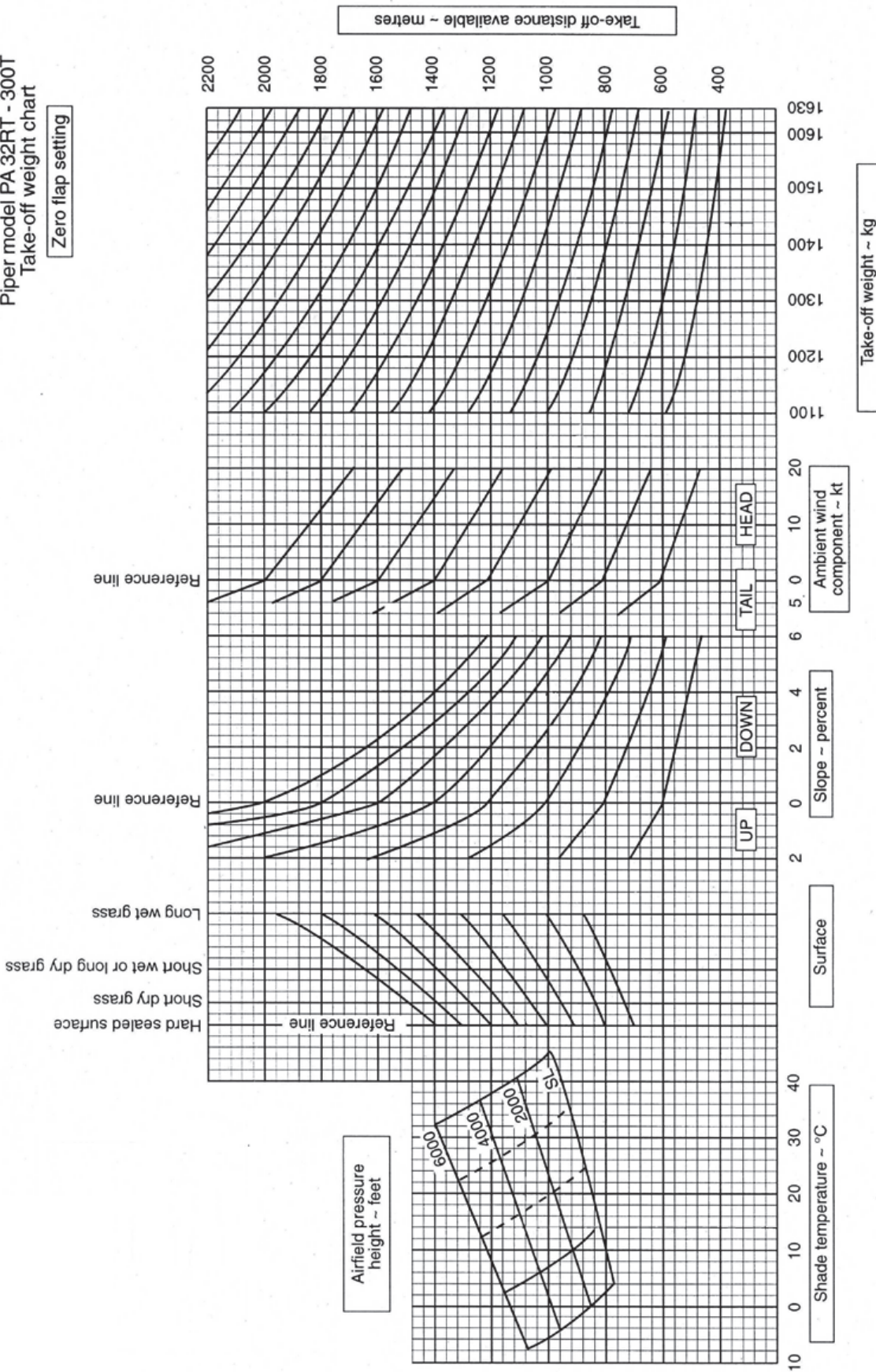
(3 marks)

Use the Performance Chart provided on page 19 to calculate the maximum take-off weight for a Piper PA-32RT-300T Turbo Lance under the stated conditions. Show **all** workings on the chart provided.

Conditions	
Pressure height	4000 ft
Temperature	14 °C
Wind	12 kt HW
Slope	2% up
Take-off distance available	1000 m
Surface	Hard sealed

Piper model PA 32RT - 300T
Take-off weight chart

Zero flap setting



Flap setting ~ Zero
Take-off safety speed 78 kt IAS
Power setting ~ Take-off
~ RPM 2700
Chart distance factor 1:15

Question 44

(2 marks)

Anti-icing systems are an important feature on many aircraft. List **two** aircraft surfaces that are typically part of an anti-icing system.

One: _____

Two: _____

Question 45

(5 marks)

In aviation, V-speeds are standard terms used to define airspeeds important or useful to the operation of all aircraft. Name the following V-speeds.

V-speed abbreviation	V-speed full name
Vno	
Va	
Vb	
Vfo	
Vs	

Question 46**(8 marks)**

In order for a helicopter to generate lift, the rotor blades must be turning. As a vertical take-off is made, forces acting on the blades result in them assuming a conical path instead of remaining in the plane perpendicular to the mast.

**After take-off**

(a) On the diagram above, draw labelled arrows to show the forces that act on the rotor blade. (2 marks)

(b) State **three** factors that influence the amount of coning. (3 marks)

One: _____

Two: _____

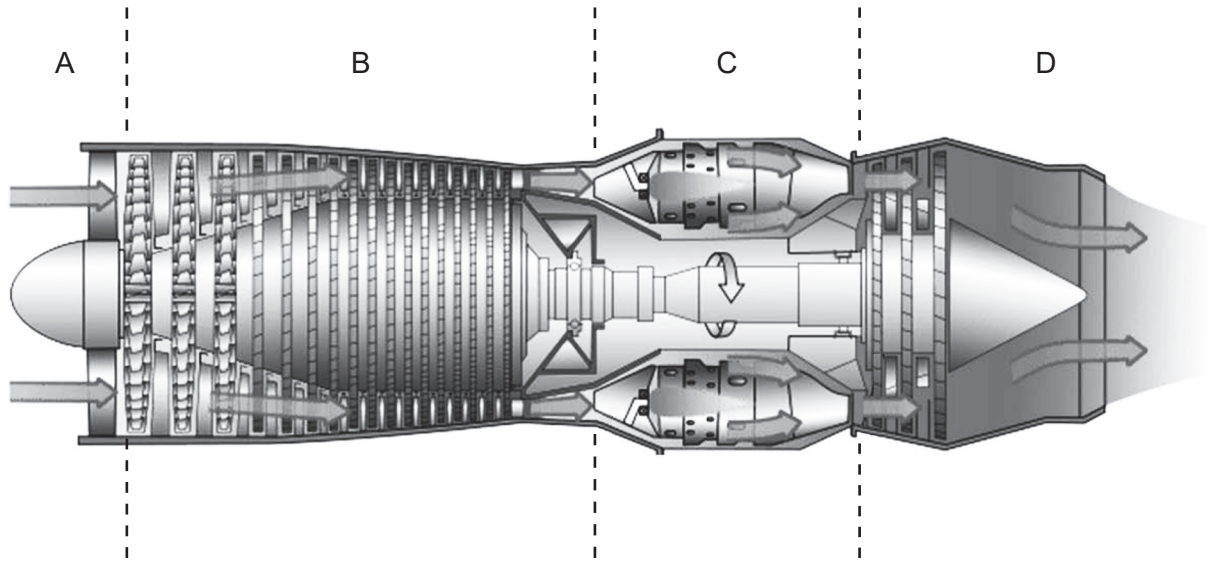
Three: _____

(c) Explain the effects of excessive coning. (3 marks)

Question 47

(8 marks)

Using the diagram below, name and describe the events associated with each of the four stages of the turbine engine.



Stage	Name and description
A	
B	
C	
D	

ACKNOWLEDGEMENTS

- Question 26(a)** Image adapted from: Smart flight training. (n.d.). *Beginner's series: Four forces of flight*. Retrieved June, 2019, from <https://smartflighttraining.com/beginners-series-four-forces-flight>
- Question 28** Image adapted from: R/C Airplane World. (n.d.). *Further RC airplane aerobatics*. Retrieved June, 2019, from <https://www.rc-airplane-world.com/more-rc-airplane-aerobatics.html>
- Question 37** TAF extract from: Bureau of Meteorology. (2019). TAF extract 61. Retrieved June, 2019, from <http://www.bom.gov.au/aviation/forecasts/taf/#61>
- Question 40** Image adapted from: Bureau of Meteorology. (2019). *Synoptic chart 24 March, 2019*. Retrieved March, 2019, from <http://www.bom.gov.au/cgi-bin/charts/charts.browse.pl>
- Question 43** PA-32RT take-off weight chart from: Yeo, M., Bowers, G., & Bennett, K. (2001) *Handbook of flight* (2nd ed.). Perth: WestOne Services, p.149. Not for operational purposes.
- Question 46** Image adapted from: Flightlearnings.com (n.d.). *Helicopter flight training: Rotor blade coning*. Retrieved June, 2019, from <http://www.danubewings.com/rotor-blade-coning/>
- Question 47** Diagram adapted from: Dahl, J. (2008). Jet engine numbered.svg [Image]. In *Wikipedia*. Retrieved May, 2019, from https://en.wikipedia.org/wiki/File:Jet_engine_numbered.svg
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