OCR
Oxford Cambridge and RSA

Friday 24 June 2016 – Morning

A2 GCE MATHEMATICS (MEI)

4754/01B Applications of Advanced Mathematics (C4) Paper B: Comprehension

QUESTION PAPER

Candidates answer on the Question Paper.

OCR supplied materials:
- Insert (inserted)
- MEI Examination Formulae and Tables (MF2)

Other materials required:
- Scientific or graphical calculator

Duration: Up to 1 hour

* 4 7 5 4 0 1 B *

* 5 9 8 4 3 8 4 9 0 2 *

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- The Insert will be found inside this document.
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.
- The Insert contains the text for use with the questions.
- You are permitted to use a scientific or graphical calculator in this paper.
- Final answers should be given to a degree of accuracy appropriate to the context.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- You may find it helpful to make notes and do some calculations as you read the passage.
- You are **not** required to hand in these notes with your question paper.
- You are advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.
- The total number of marks for this paper is **18**.
- This document consists of **8** pages. Any blank pages are indicated.

1 The blades of a wind turbine sweep out a circle of diameter 90 m. The turbine's blade tip height is 149.5 m.

Calculate the hub height of this turbine. **[1]**

1	

2 In lines 46 and 47, the article says
'So someone at the point of observation would not see the bottom 12 m of the turbine.'

Explain how the figure of 12 m was obtained. **[2]**

2

3 A wind turbine with a blade tip height of 125 m is seen from a distance of 623 m. The ground is level and horizontal so that the whole of the turbine can be seen.

(i) Calculate the angle of elevation of the tip of a blade when it is pointing vertically upwards. You should assume that the viewer's eye is at the same height as the base of the turbine. **[1]**

The wind turbine is shown on a photomontage; the viewing distance is stated to be 51.4 cm.

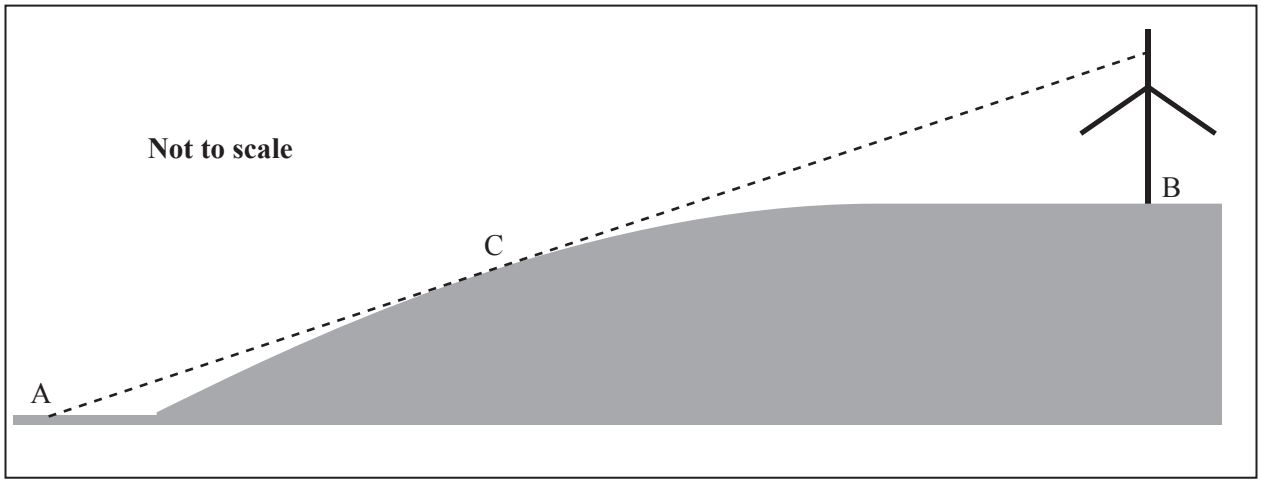
(ii) Calculate the height that the turbine would have on the photomontage if it were seen with the same angle of elevation as that in part **(i)**. **[1]**

The image of the wind turbine is 7.3 cm high when the photomontage is printed on A4 paper.

(iii) Show that when the photomontage is printed on A3 paper, the height of the wind turbine is consistent with the angle of elevation found in part **(i)**. **[2]**

3 (i)	
3 (ii)	

3 (iii)	



4 The diagram illustrates the situation in Fig. 5 of the article.

The blade tip height of the wind turbine is 99.5 m.

The base, B, of the turbine is 120 m higher than A and at a horizontal distance of 320 m from A.

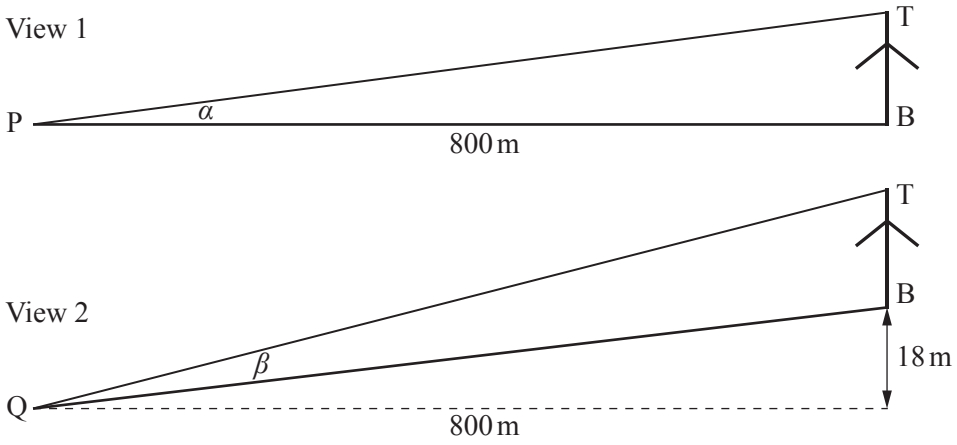
An observer at A can see the top 20 m of a blade when it is pointing vertically upwards, as in the diagram.

The observer's line of vision is a tangent to the hill at C. The horizontal distance from A to C is 140 m.

Find the height of C above A. **[4]**

4

Not to scale



5 In the diagram, the wind turbine BT is observed from two different positions P and Q. The blade tip height of the turbine is 72 m.

Both P and Q are a horizontal distance of 800 m from the turbine.

P is at the same height as the base, B, of the turbine. Q is 18 m below the level of B.

The angle of elevation from P is α; the angle TQB is β.

Show that the angles α and β, in degrees, are the same to 2 significant figures. **[3]**

5	

6 In line 96, the article says

'As a result of the study, it was recommended that a focal length of 75 mm should be used.'

Make a reasoned estimate of the percentages of participants in Stirling University's study who would have thought the photomontages made the wind turbines appear 'Too large', 'About right' and 'Too small' if a lens of focal length 75 mm had been used. You must state your assumptions clearly. **[4]**

6	

END OF QUESTION PAPER