6: **In this question you must show all stages of your working.**
Solutions relying on calculator technology are not acceptable.

(i) Given that θ is measured in degrees and

- $\cos\theta = \dfrac{1}{\sqrt{5}}$
- $180° < \theta < 360°$

use trigonometric identities to find the exact value of

(a) $\sin\theta$

(b) $\tan\theta$

giving the answers as fully simplified surds where appropriate.

(4)

(ii)

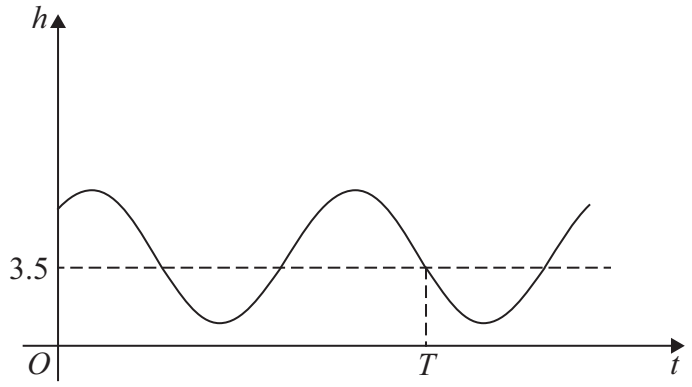

Figure 2

The height of sea water, h metres, on a harbour wall, t hours after midnight on a particular day is given by

$$h = 4 + 3\cos(30t - 40)° \qquad 0 \leqslant t < 24$$

A sketch of h against t is shown in Figure 2.

(a) Find the minimum height of sea water on the harbour wall.

(1)

(b) Find the exact time of day when this minimum height **first** occurs.

(3)

When $t = T$, as shown in Figure 2, a boat enters the harbour when the height of sea water on the harbour wall is 3.5 m.

(c) Use Figure 2 and the given equation to find the value of T to 2 decimal places.

(4)

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Question 6 continued

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Question 6 continued

(Total for Question 6 is 12 marks)

7: **In this question you must show all stages of your working.**
Solutions relying entirely on calculator technology are not acceptable.

The binomial expansion, in ascending powers of x, of $(1 + kx)^n$ is

$$1 - 24x + 270x^2 + px^3 + ...$$

where k and p are constants and n is an integer greater than 1

(a) Use this information to set up and solve two simultaneous equations to find the value of k and the value of n.

(6)

(b) Hence find the value of p.

(2)

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