

Engineering Studies

Section III (continued)

Marks

Question 18 — Engineering and the Engineering Report (10 marks)

- (a) Discuss the use of CAD systems as an alternative to traditional drawing methods.

3

CAD systems have many advantages over traditional drawing ~~systems~~ ^{methods}. These are:

- ability to change the design easily
- ability to add ~~measurements~~ ^{dimensioning} ~~accurately~~ ^{automatically}
- more precise drawing
- ability to automatically produce orthogonal drawings from pictorial and vice versa
- ease of adding colours and textures to surfaces

A major drawback of CAD systems is that good knowledge of the ~~program~~ ^{software} ~~is~~ ^{is} needed to use the full power of CAD.

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Question 18 (continued)

(b)



- (i) In many public areas, polymer containers similar to those shown are provided for rubbish and recyclable materials. Describe a forming process to produce the main body of these large containers. 2

Thermosoftening plastic such as polyethylene is melted and then injected into a mould. The mould is taken apart when the plastic sets ~~and~~ and the container is taken out. The process is called injection moulding.

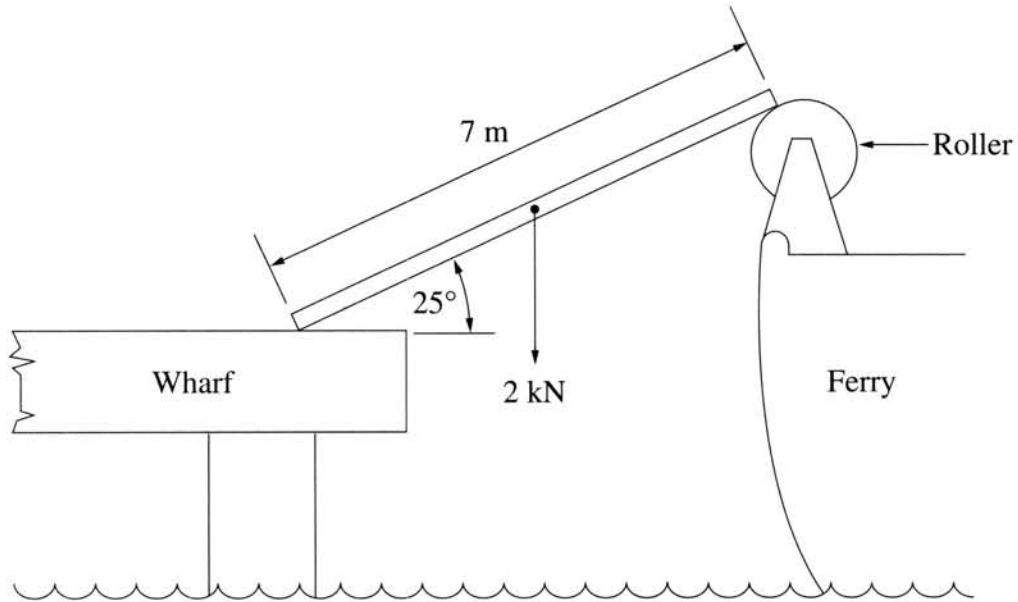
- (ii) The lids used for the containers are moulded from polyethylene. Outline the reasons for this being a suitable choice of material in service. 2

Polyethylene is light, ~~and~~ strong and durable. It has a slippery surface preventing build up of dirt on handles of the lid. It is more resistant to UV radiation than other plastics (such as PVC)

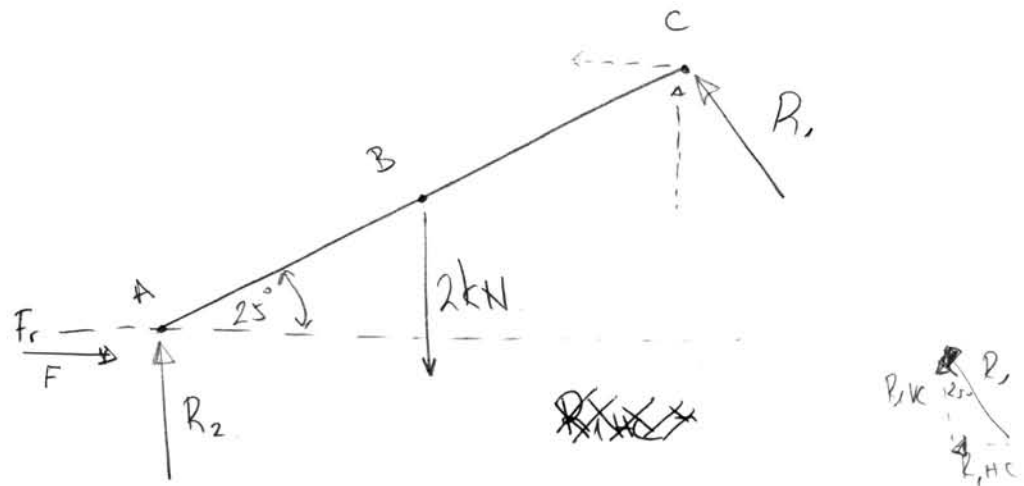
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Question 18 (continued)

- (c) A loading ramp between a ferry and a wharf is shown. The ramp has a weight of 2 kN and a coefficient of static friction with the wharf of 0.2. There is no friction at the roller support. 3



Sketch a free-body diagram of the ramp. Show whether the ramp will slip or remain static for these conditions.



$$\sum M_A = 0 \quad 0 = (3.5 \times \cos 25^\circ \times 2 \text{ kN}) - (R_1 \times 7)$$

$$R_1 = 906 \text{ N} \quad R_{1VC} = 821 \text{ N}$$

$$\sum F \uparrow = \sum F \downarrow \quad R_2 = 1179 \text{ N} \quad R_{1HC} = 383 \text{ N}$$

$$F_{r \text{ max}} = \mu N = 0.2 \times R_2 = 236 \text{ N}$$

$\therefore R_{1HC} > F_{r \text{ max}}$

End of paper

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∴ The ramp will slip.