

Question 11

- (a) (i) Discuss briefly the problems of measuring the coefficient of viscosity of a liquid.
- (ii) Describe briefly how a falling-sphere viscometer is used and give one disadvantage of this type of viscometer.
- (iii) Describe in a few words the use of a viscometer which involves the flow of the liquid through a pipe.

[8]

(b)



(i)

(ii)

The figure shows an aerofoil facing a streaming fluid at (i) low incidence and (ii) high incidence. With the aid of suitable diagrams contrast the flow patterns for a viscous model of these fluid flows. Comment on the difference between the lift forces in each case and suggest what might happen to an aeroplane with such a high angle of incidence as that in (ii). How might aircraft designers alleviate the problem of boundary-layer separation in situations such as (ii)?

[6]

- (c) Transverse waves on a light elastic string can be modelled by the one-dimensional wave equation

$$\frac{\partial^2 u}{\partial x^2} = \frac{1}{c^2} \frac{\partial^2 u}{\partial t^2}.$$

Briefly describe the initial and boundary conditions which are appropriate for the solution of this partial differential equation for

- (i) an infinite string,
- (ii) a finite string.

State in one or two sentences methods of solution which can be used for

- (i) an infinite string,
- (ii) a finite string.

Describe in a few words what is meant by

- (i) a travelling or progressive wave,
- (ii) a standing wave.

[6]

[END OF QUESTION PAPER]