1 **(a)** State the two conditions necessary for a system to be in equilibrium.

(i) ……

(ii) ……[2]

(b) Explain what is meant by the *centre of gravity* of a body.

…….... [1]

(c) A rod AB is hinged to a wall at A. The rod is held horizontally by means of a cord BD, attached to the rod at end B and to the wall at D, as shown in Fig. 1.1.

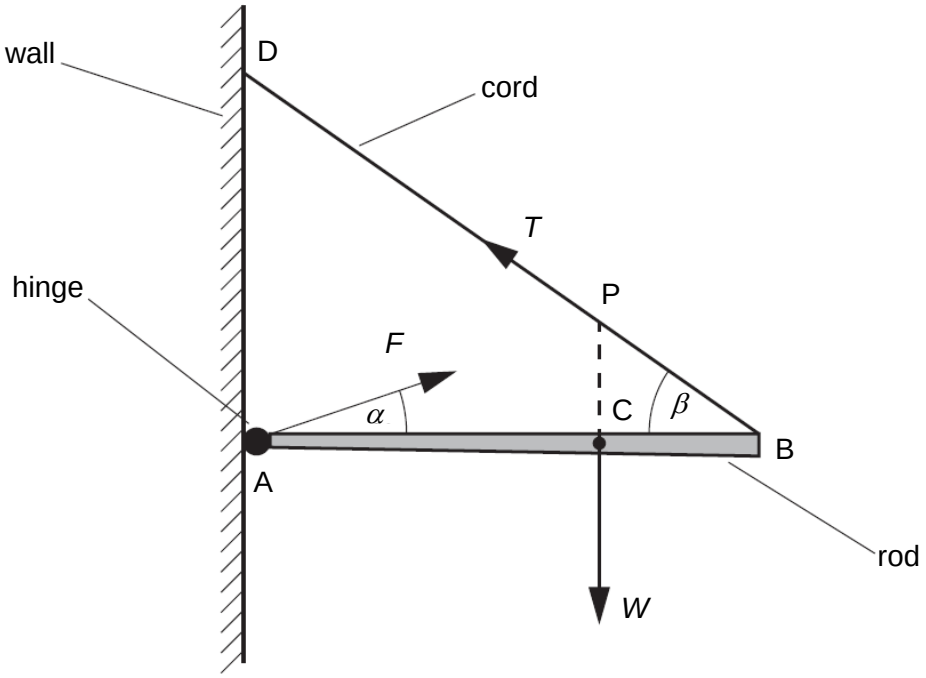

Fig. 1.1

The rod has weight *W* and the centre of gravity of the rod is at C.

The rod is held in equilibrium by a force *T* in the cord and a force *F* produced at the hinge.

(i) The line of action of the weight *W* of the rod passes through the cord at point P.

Explain why, for the rod to be in equilibrium, the force *F* produced at the hinge must also pass through point P.

……

……

……[2]

(ii) It is given that W = 10 N, β = 30° and length AC = $\frac{2}{3}$ AB.

Calculate
1. tension T, and

T = …….. N [2]

2. angle α.

α = …….. ° [3]

[Total: 10]