Q 1) During the engine test on the ground propeller thrust of T = 3000N is generated on the 1800kg airplane with mass center at 'G'. The mail wheels at 'B' are locked and don't skid, small wheel at 'A' has no brake. Compute the percentage change 'n' in the normal forces at 'A' and 'B' as compared with their 'engine off' values.

Q 2) The hook wrench is used to turn the shaft. If a moment of 80Nm is required to turn the 200mm diameter collar about its centre 'O' under the action of the applied force 'P', determine the contact force 'R' on the smooth surface at 'A'.
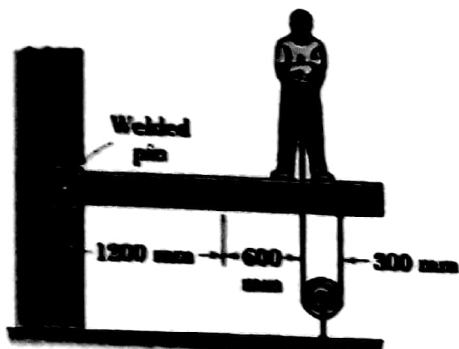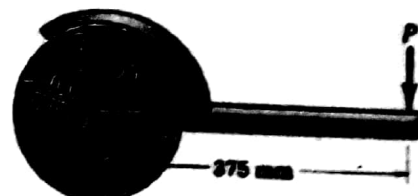
Q 3) The pin 'A', which connects the 200kg steel beam with centre of gravity at 'G' to the vertical column is welded both the beam and the column. To test the weld, the 80kg man loads the beam by exerting a 300N force on the rope which passes through a hole in a beam as shown in the figure. Calculate the torque (couple) M supported by the pin

Q 4) A smooth homogeneous sphere rest in 120° groove and bears against the end plate which is normal to the direction of the groove. Determine the angle 'θ', measure from the horizontal for which the reaction on each side of the groove equals to the force supported by the endplate.
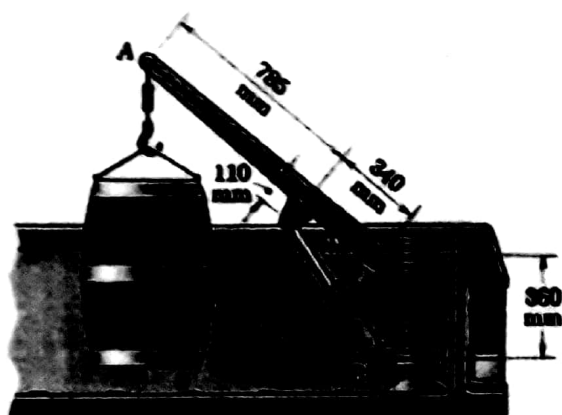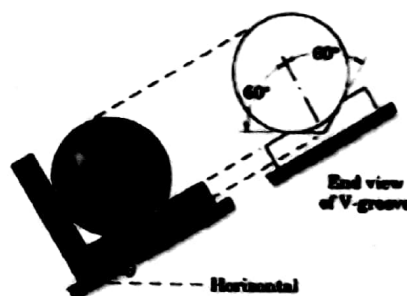
Q 5) The small crane is mounted on one side of the bed of a pickup truck. For θ = 40° , Determine the magnitude of the force supported by the pin at "O" and the oil pressure "p" against the 50 mm diameter piston of the hydraulic cylinder 'BC'.

Q 6) With what force magnitude 'T' must the person pull on the cable in order to cause the scale 'A' to read 500N?. The weight of the pulley and the cables are negligible. State any assumptions
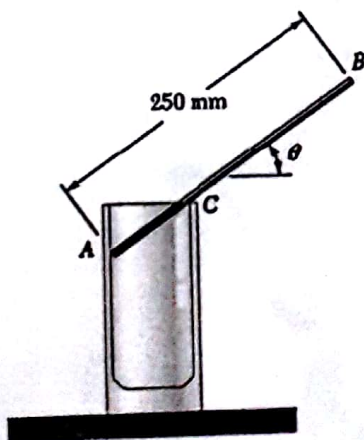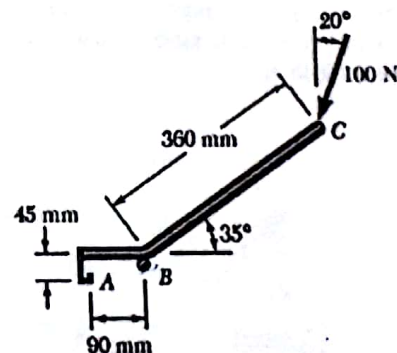
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Q 7) To remove a nail, a small block of wood is placed under a crowbar and a horizontal force 'P' is applied as shown in the figure. Knowing that 'l' = 35mm and P = 300N, determine the vertical force on the nail and the reaction at 'B'

360mm

50°
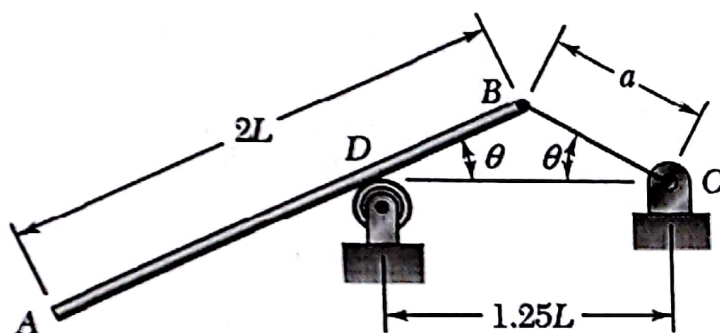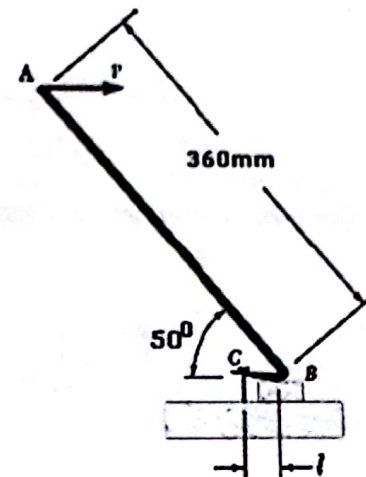
Q 8) A uniform slender rod of length '2L' and mass 'm' rests against a roller at 'D' and is held in the equilibrium position shown by a cord of length 'a'. knowing that L = 200mm determine **(a)** the angle 'θ', **(b)** the length 'a'

2L

D   θ θ

a

C

1.25L

A

Q 9) To remove the lid from a **5-gallon pail**, the toll shown in Figure is used to apply an upward and radially outward force to the bottom inside rim of the lid. Assuming that the rim rests against the tool at 'A' and that a **100N** force is applied as indicated to the handle, determine the force acting on the rim.

20°

100 N

360 mm   C

45 mm   35°

A   B

90 mm

250 mm

B

θ

C

A

Q 10) A uniform slender rod of mass **5g** and length **250mm** is balanced on a glass of inner diameter 70mm. Neglecting friction, determine the angle 'θ'

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