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Full-Time B.E./B.Tech. DEGREE EXAMINATIONS, MAY 2012

II – Semester, Regulations 2008

(Common to ALL Branches of Engineering & Technology of University Departments of CEGC, A.C.Tech., and MIT Campuses of Anna University, Chennai – 25)

Also common to II Semester B.E. (Mechanical and Civil – Tamil Medium)

GE 9151 – Engineering Mechanics

Duration: 3-Hours

Max. Marks: 100

Answer ALL questions

Part – A (10X2 = 20 marks)

- 1 What are the equilibrium conditions to be satisfied for a particle applied with a system of coplanar, concurrent forces?
- 2 A body is on a smooth inclined plane as shown in Fig. 2. Find the force 'F'

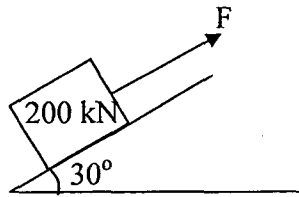


Fig. 2

- 3 What are the reactions at a hinged support of a plane beam?
- 4 State the reason why a fixed support develops a reaction moment?
- 5 State the Pappus-Guldinus Theorem -1.
- 6 Locate the centroid for the area shown in Fig. 6

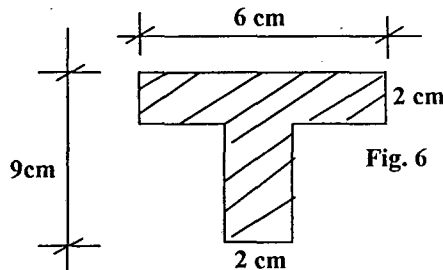


Fig. 6

- 7 What is the reaction force experienced by the man of weight 600 N travelling vertically upwards in a lift at constant acceleration of 2 m/s^2 ?
- 8 A ball is dropped from a building of 40 m height. What is the velocity of the ball after 3s?
- 9 What is the angle turned by a fan while it starts from rest and accelerates at a constant rate of 3 rad/s^2 for an interval of 15 s?
- 10 A block of 2000 N is being pulled on floor whose co-efficient of friction with the block surface is 0.1. What is the maximum frictional force experienced by the block?

Part – B (5 X 16 = 80 marks)

Q11 compulsory & from Q12 onwards answer either (a) or (b)

- 11 i) Block A weighing 2 kN rests on a horizontal plane and supports on top of it another block of weight 0.8 kN as shown in Fig. 11-(i). Block B is attached to a vertical wall by an inclined string which makes an angle of 30° with the horizontal. What should be the value of horizontal force P to cause the motion of the lower block to impend? Take $\mu=0.28$ for all the surfaces. (8)

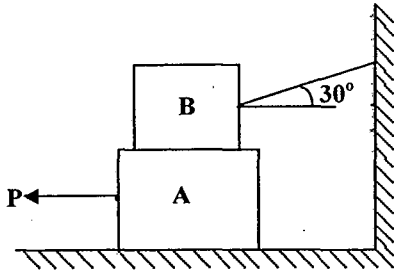


Fig. 11-(i)

- ii) A body resting on a rough horizontal plane requires a pull of 200 N (8)
 inclined at 40° to the horizontal plane just to move it. It is found that a push of 250 N inclined at 40° to the x-axis can also make the body to move. Determine the weight of the body and the coefficient of friction.
- 12 a) The tension in wire 'PQ' is 100 kN. Determine tensions in other wires 'PR' and 'PS' so that the resultant of the three forces applied at 'P' is vertical. Find the magnitude of the resultant. Refer Fig. 12a. (16)

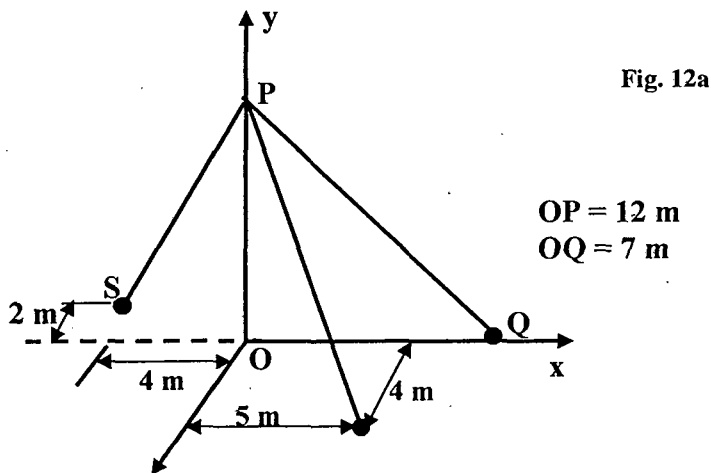


Fig. 12a

[OR].

- 12 b) (i) Determine the magnitudes of F_1 and F_2 which are holding the body of weight 6 kN suspended from the string at point 'O' as shown Fig. 12b-(i). Assume the pulley over which the string passes is smooth (8)

(ii) Determine the required length of cord PR in Fig. 12b-(ii) so that the 10 kg block suspended in the position shown. The un-deformed length of the spring PQ is 0.5 m, and the has the stiffness 250 N/m. (8)

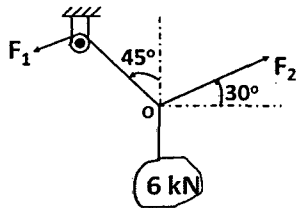


Fig. 12b-(i)

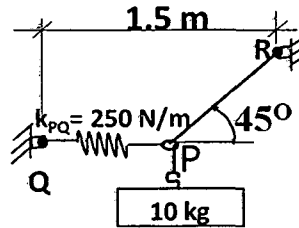


Fig. 12b-(ii)

- 13 a) i) A brake pedal shown in the Fig. 13a-(i). Determine the magnitude and direction of the smallest force 'F' which can produce the moment of 110 N-m anticlockwise direction about the point 'O'. (ii) if the force $F = 500\text{N}$ and $\theta = 45^\circ$, determine moment of force 'F' about the point 'O'.

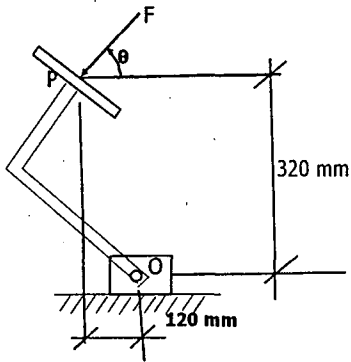


Fig. 13a-(i)

(ii) 2000N vertical load is applied at the end 'Q' of the rod QR whose length is 200mm. A weight of $W=2000\text{N}$ is hanged with the help of a cord connected at point 'Q' passing over a smooth pulley at point 'P'. For equilibrium, find angle θ and reactions at point 'R'. (Refer Fig. 13a-(ii)) (8)

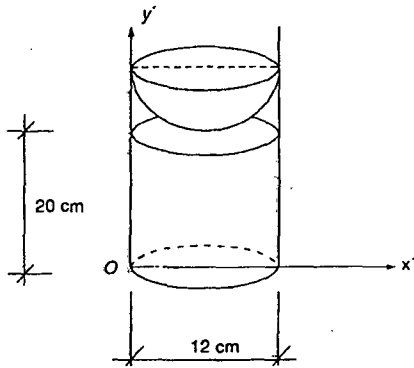


Fig. 14a-(ii)

[OR]

- 14 b) For the plane section in Fig. 14b, determine the moment of inertia about its horizontal and vertical centroidal axes. (16)

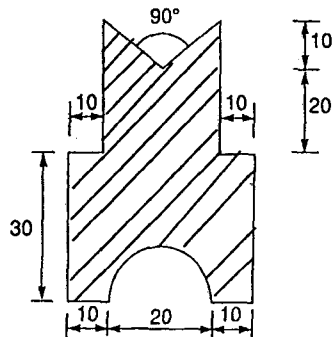


Fig. 14b

All dimensions are in 'mm'

- 15 a) i) A car travelling at a constant speed of 54km/h is suddenly applied with brakes to rest in 10 s. What is the distance travelled? (4)
 ii) A projectile is fired with an initial velocity of V_1 at angle of 30° with the horizontal. Find the required initial velocity V_1 if the projectile is to target (i) point Q and (ii) Point R (Refer the Fig. 15a) (12)

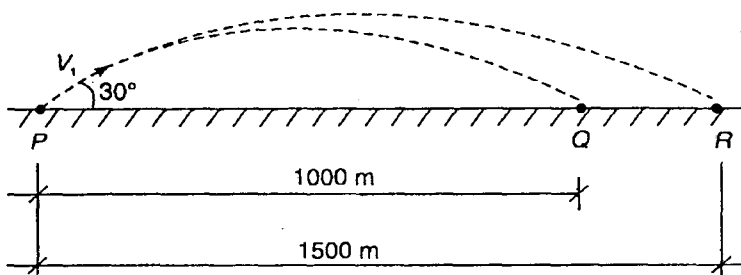


Fig. 15a

[OR]

- 15 b) An elevator cage of mine shaft weighing 8 kN when empty is lifted or lowered by means of a wire rope. A man weighing 600 N, enters it and lowered with uniform acceleration such that when a distance of 187.5 m was covered, the velocity of the cage was 25 m/s. Determine the tension in the rope and the force exerted by the man on the floor of the cage. (16)