

Total number of printed pages – 7

B. Arch
BEG 2001

Second Semester Examination – 2008

MECHANICS – II

Full Marks – 70

Time : 3 Hours

*Answer Question No. 1 which is compulsory
and any **five** from the rest.*

*The figures in the right-hand margin
indicate marks.*



1. Answer the following questions : 2×10
- (a) Define radius of gyration.
 - (b) Explain shear strain.
 - (c) An axial load is applied on a circular section of diameter D . If the same load is applied on a hollow circular section with inner diameter $0.5 D$, find the ratio of the stresses.

- (d) What do you mean by product of inertia?
 - (e) State principle of virtual work.
 - (f) Efficiency of machine in an inclined plane decreases with increase in coefficient of friction. Justify.
 - (g) Differentiate between stable and unstable equilibrium.
 - (h) Explain the term center of oscillation in case of compound pendulum.
 - (i) Define poisson's ratio.
 - (j) Distinguish between normal and tangential acceleration.
2. (a) A beam AB of length 3 meters is hinged at A and supported at C on a roller at a distance of 2 meters from the hinged end. Determine the reaction of the support C

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using method of virtual work. The beam carries a load of 15 kN at a distance of 1 meter from the hinged end. 5

- (b) A solid of uniform density is made of a hemisphere and a right circular cone have a common base of radius r as shown in Fig.1 Determine the largest value of height h of the cone consistent with stability of the body in the vertical position. 5

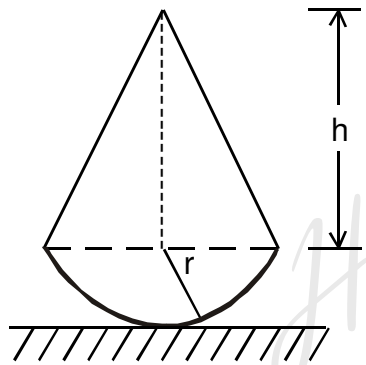


Fig. 1

3. (a) Find the polar moment of inertia of a circular of diameter D with respect to its center. 3

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- (b) Find the moment of inertia about an axis parallel to x axis and passing through the center of gravity of the 'T' section shown in Fig. 2. 7

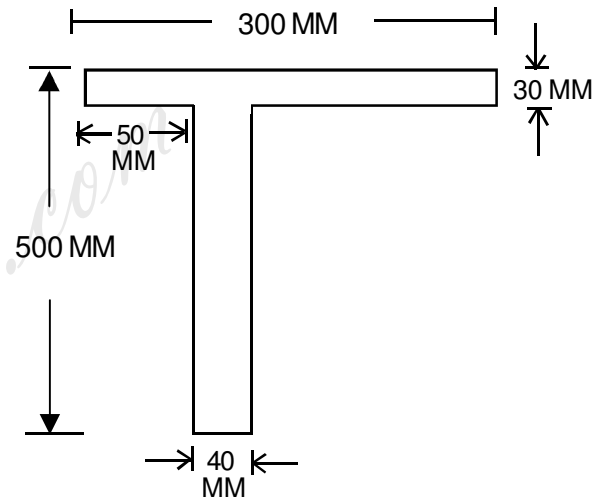


Fig. 2

4. (a) The coefficient of friction between wet asphalt pavement and the tires of an automobile is found to have the value $\mu = 0.2$. At what constant speed can the automobile travel around a curve of radius 250 meters without skidding if the road is level? 4

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(b) Prove that the path of a projectile motion is same as the equation of a parabola having a vertical axis. 6

5. (a) Calculate the period of small oscillation of a circular cylindrical bar of length 'L' and diameter D suspended from one end. 6

(b) A shaft of radius r rotates with constant angular speed w in bearings for which the coefficient of friction is μ . Through what angle will it rotate after the driving torque is removed ? 4

6. (a) A steel rod 4 meters long and 20 mm diameter is subjected to an axial tensile load of 45 kN. Find the change in length and change in diameter. Take $E = 200000$ N/mm² and $\mu = 0.25$. 5

(b) Explain Mohr's circle method to obtain normal and tangential stress on a plane at an angle θ with the major principal plane p_1 . The plane is subjected to two unequal like principal stress p_1 and p_2 . 5

7. The following data refer to a mild steel specimen tested in a laboratory 2×5

- (i) Diameter of specimen = 25mm
- (ii) Length of specimen = 320 mm
- (iii) Extension under a load of 15 kN = 0.06 mm
- (iv) Load at yield point = 150 kN
- (v) Maximum load = 220 kN
- (vi) Length of the specimen after failure = 380 mm
- (vii) Neck diameter = 20 mm

Determine

- (a) Young's modulus
- (b) Stress at Yield point
- (c) Ultimate stress
- (d) percentage of elongation
- (e) percentage reduction in area

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8. (a) A small ball of weight W starts from rest at A and moves without friction along a curved path ACB as shown in Fig. 3 in a vertical plane defined by the equation $y = \frac{4\delta}{l^2} x^2$. Determine the reaction exerted on the ball by the path at point C. 5

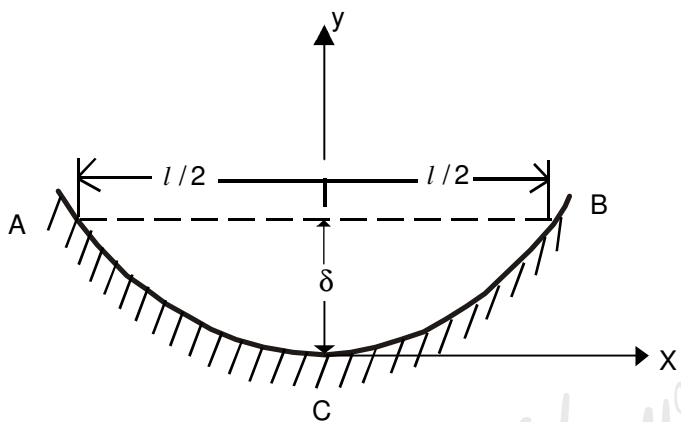


Fig. 3

- (b) Explain with the neat sketch : 2.5×2
- (i) Parallel axis theorem
 - (ii) Limit of proportionality.