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.

P.T.O.

   (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 poission'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

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

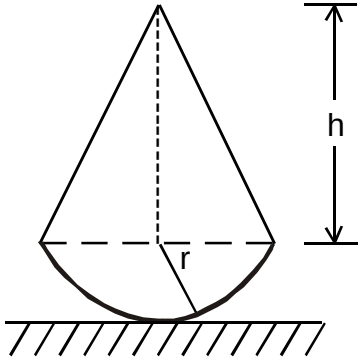

Fig. 1

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

(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

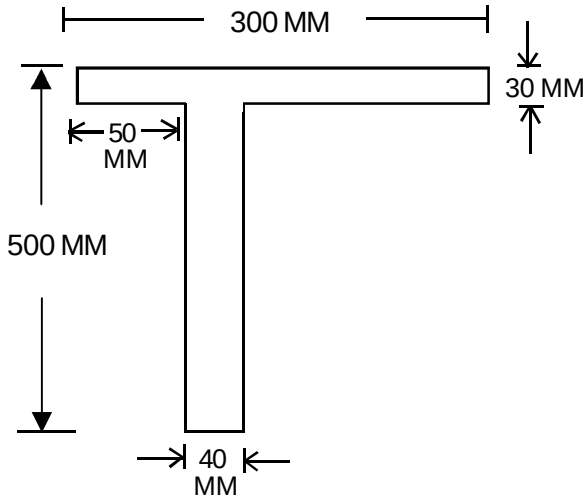

Fig. 2

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

(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/mm^2 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 modulous

(b) Stress at Yield point

(c) Ultimate stress

(d) percentage of elongation

(e) percentage reduction in area

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

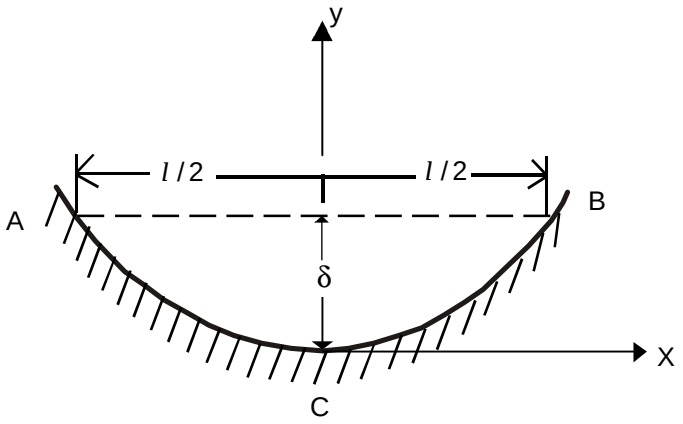

Fig. 3

(b) Explain with the neat sketch : 2.5×2

(i) Parallel axis theorem

(ii) Limit of proportionality.

———————