

Model Question Paper

Engg. Mech. [EME 102/202]

Section A

Note:- Attempt all questions. All questions carry equal marks.

10×2=20

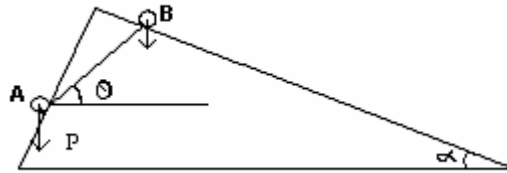
1. The resultant of two equal forces of magnitude 'P' acting at an angle α with each other is _____.
2. If 'j' represents the number of joints and 'm' represents number of members of a truss. The condition for perfect truss is _____, and the condition for deficient truss is _____.
3. The expression for the moment of inertia of a triangle, in term of its base 'a' and height 'h', about its (triangle) base is given as _____.
4. The range of projectile is maximum when the angle of projection is _____.
5. In a cantilever beam carrying a concentrated load at the free end, the bending moment will be zero at _____, and maximum at _____.
6. A particle inside a hollow sphere of radius r having coefficient of friction can rest up to height equal to
(a) $r/2$ (b) $r/4$ (c) $r/8$ (d) $0.134r$
7. Which of the following is/are statically indeterminate beam(s)?
(a) Cantilever beam (b) Simply supported beam
(c) continuous beam (d) None of the above
8. The C.G. of a solid hemisphere lies on the central radius at a distance
(a) $3r/2$ from the plane base (b) $3r/4$ from the plane base
(c) $3r/5$ from the plane base (d) $3r/8$ from the plane base
9. Three perfectly elastic and similar balls are lying on the floor. When one is struck with a velocity 'v' it strikes second and onwards third. What will be their resultant velocity?
(a) v (b) $v/2$ (c) $v/3$ (d) $v/4$
10. Hooke's law is valid up to
(a) Elastic limit (b) Proportionality limit (c) Yield point (d) No limit

Section B

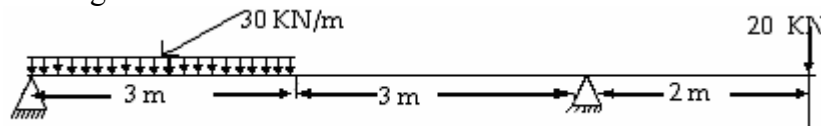
Note:- Attempt any three question. All questions carry equal marks.

10×3=30

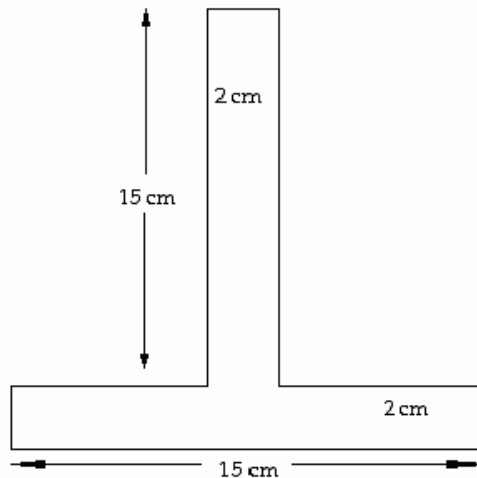
- 1 Two rollers of weight P and Q are connected by a flexible string AB . The rollers rest on two mutually perpendicular planes DE and EF as shown in figure.



- Calculate the tension in the string and the angle θ that it makes with horizontal when the system is in equilibrium.
- 2 Draw the shear force and bending moment diagram for the over hanged beam shown in figure



3. Calculate the moment of inertia of T section about an axis parallel to the base of the T and passing through its centre of gravity.



4. A bullet of weight 50 gm is fired into a body of weight 5 kg, which is suspended by a string 1 m long. Due to this impact, the 5 kg body swings through an angle of 30° from the vertical. Calculate the velocity of the bullet.
5. A solid metal shaft of diameter 50 mm & length 2 m is twisted in a testing machine until one end rotates through an angle of 5° with respect to other end. For this twist, torque is 70 Nm. Calculate the maximum shear stress in the shaft and shear modulus of elasticity G .

Section C

Note: Attempt all questions. All questions carry equal marks

10×5=50

1. Attempt any TWO parts:

(a) Explain the followings:

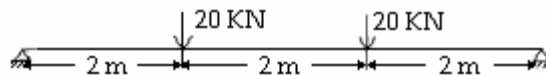
(i) Laws of Friction (ii) Transmissibility of Force (iii) Free body diagram.

(b) What are the necessary and sufficient conditions for equilibrium for a concurrent force system?

(c) Derive the expression between tensions on two sides of a belt and pulley system in terms of angle of wrap and coefficient of friction.

2. Attempt any TWO parts:

(a) Draw bending moment diagram for the following simply supported beam:

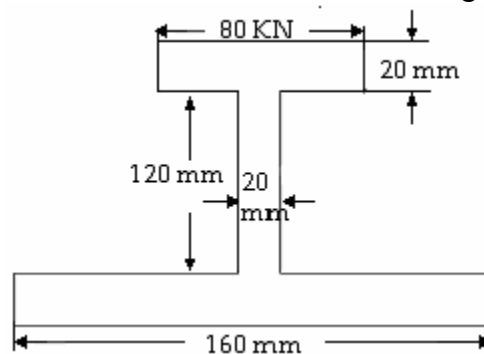


(b) What is plain truss? Explain the assumptions taken for the analysis of a beam.

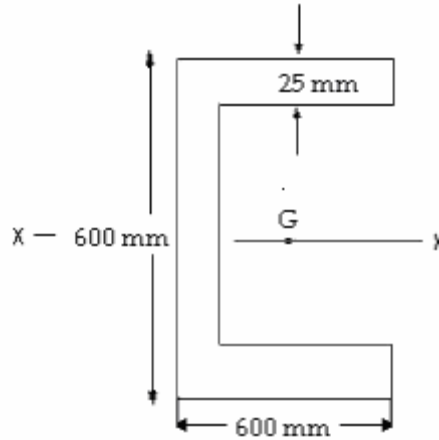
(c) Derive an expression between loading, shear force and bending moment for a beam subjected to distributed load.

3. Attempt any TWO parts:

(a) Find the location of centroid of I section shown in figure.



(b) Find the moment of inertia of channel section shown in figure about xx axis



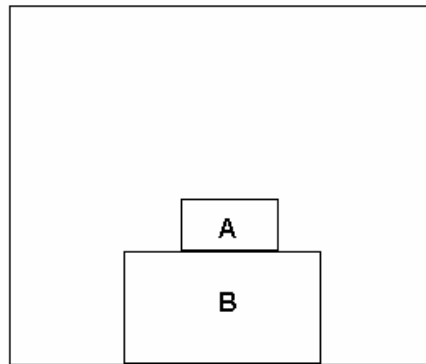
(c) What are perpendicular and parallel axis theorems? Discuss their application.

4. Attempt any TWO parts:

(a) A food packet is dropped from a plane going at an altitude of 100m, what is the path of packet as seen from plane? What is the path as seen from the ground? What will be the actual path?

(b) Is it possible for a particle to describe a curved path if no force acts on it? Does the answer depend on frame of reference chosen to view the particle?

(c) The elevator shown in figure is descending with an acceleration of 2 m/s. The mass of the block A is 0.5 kg. What force is exerted by block A on block B?



5. Attempt any TWO parts:

(a) A torque of 20 kNm is applied to a shaft of 7 cm diameter. Calculate the maximum shear stress in the shaft. Also show the variation of shear force along the diameter of the shaft.

(b) Draw stress-strain diagram for Mild Steel specimen under tension. Discuss all significant points on it.

(c) Derive expressions for polar moduli for solid and hollow shafts.