Printed Pages:03 **Sub Code:KOE041**

Paper Id: 238131 **Roll No.** | | | | | | | | | | |

B.TECH
(SEM IV) THEORY EXAMINATION 2022-23
ENGINEERING MECHANICS

Time: 3 Hours ***Total Marks: 100***

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

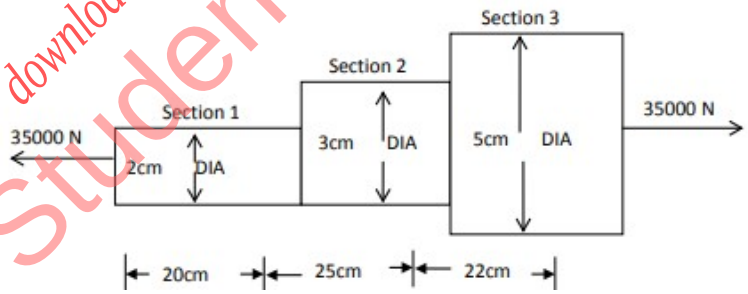
1. Attempt *all* questions in brief. **2 x 10 = 20**

(a) State the D'Alembert's principle and its application.
(b) Define moment of inertia.
(c) Enlist different types of beams with proper sketch.
(d) How will you determine the forces in a member by method of joints?
(e) State perpendicular and parallel axis theorem.
(f) Define Normal and Shear stress.
(g) Differentiate between collinear and concurrent force system.
(h) Explain the different types of coplanar forces.
(i) State law of conservation of momentum and its application.
(j) Differentiate between centroid and center of gravity.

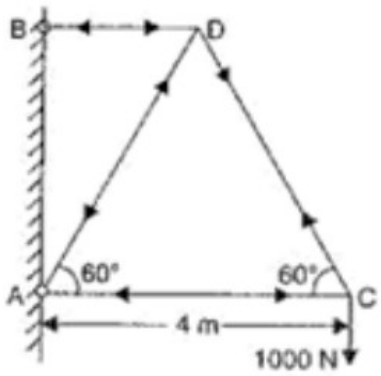
SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

(a) An axial pull of 35kN is acting on a bar consisting of three lengths as shown in figure. If the young's modulus (E) = 2.1×10^5 N/mm^2, determine i)Stresses in each section and ii)Total extension of the bar



(b) Determine the forces in all the members of the cantilever truss as shown in figure.



(c) Find the moment of inertia of a T-section with flange as 150 mm × 50 mm and web as 150 mm × 50 mm about Y-Y axes through the centre of gravity of the section.

(d) A motor car takes 10 seconds to cover 30 meters and12 seconds to cover 42 meters. Find the uniform acceleration of the car and its velocity at the end of 15seconds.

(e) Derive bending equation and write the assumptions involved.

SECTION C

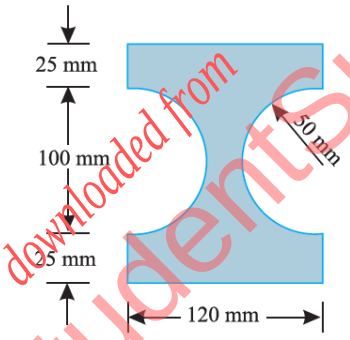
3. Attempt any *one* part of the following: 10 x 1 = 10

(a) A uniform ladder of 7m rests against a vertical wall with which it makes an angle of 45º, the coefficient of friction between the ladder and the wall is 0.4 and that between ladder and the floor is 0.5. If a man, whose weight is one half of that of the ladder, ascends it, how high will it be when the ladder slips?

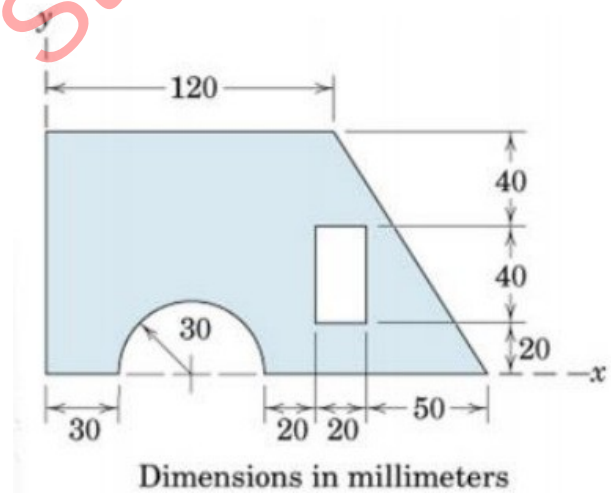
(b) A body resting on a rough horizontal plane required a pull of 24N inclined at 30º to the plane just to move it. It was also found that a push of 30N at 30º to the plane was just enough to cause motion to impend. Make calculations for the weight of body and the coefficient of friction.

4. Attempt any *one* part of the following: 10 x 1 = 10

(a) Determine the moment of inertia of the section about horizontal axes passing through the centroid of the section.

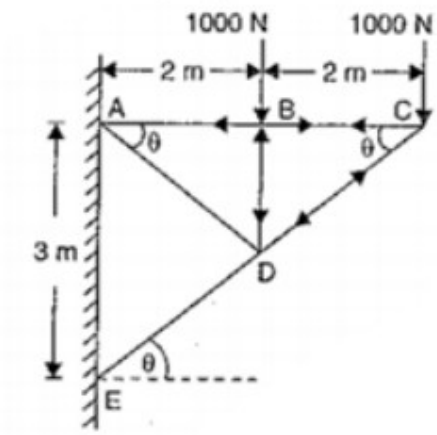


(b) Find the centroid of the shaded area.

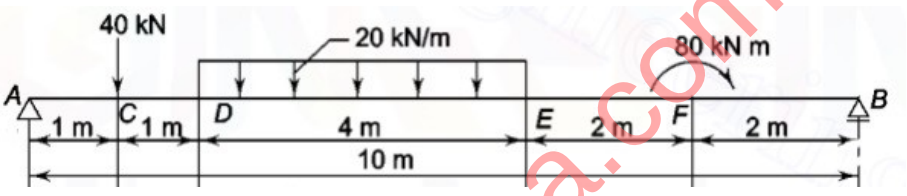


5. Attempt any *one* part of the following: 10 x 1 = 10

(a) Determine the forces in all the members of the cantilever truss as **shown in figure**.

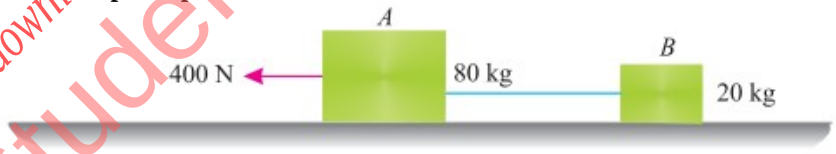


(b) Draw Shear force and Bending moment **diagram of loaded beam as shown in fig.**



6. Attempt any *one* part of the following: 10x 1 = 10

(a) Two bodies A and B of mass 80 kg and 20 kg are connected by a thread and move along a rough horizontal plane under the action of a force 400 N applied to **the first body of mass 80 kg as shown in FigThe coefficient of friction** between the sliding surfaces of the bodies and the plane is 0.3. Determine the acceleration of the two bodies and the tension in the thread, using D' Alembert's principle.



(b) A **body of mass 10kg moving towards with a velocity of 8m/s strikes with** another body of 20 kg mass moving towards left with 25m/s. Determine

(i) Final velocity of the two bodies
(ii) Loss in kinetic energy due to impact
(iii) Impulse acting on either body during impact

Take coefficient of restitution as 0.65

7. Attempt any *one* part of the following: 10 x 1 = 10

(a) A solid shaft transmits power at the rate of 2000KW at the speed of 60RPM. If the safe allowable stress is 80MN/m^2, find the minimum **diameter of the shaft.**

(b) A rectangular beam 60 mm wide and 150 mm deep is simply supported over a span of 6 m. If the beam is subjected to central point load of 12 kN, find the maximum bending stress induced in the beam section.