

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

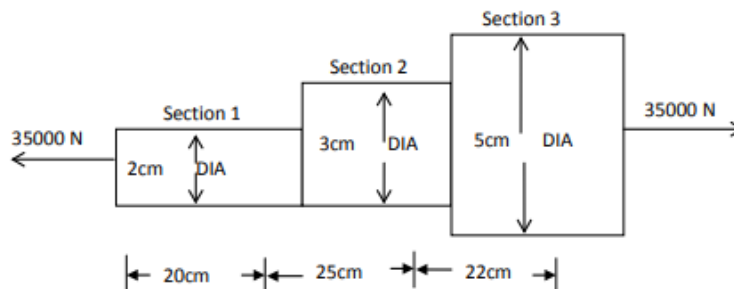
- (a) State the D'Alembert's principle and its application.
- (b) Define moment of inertia.
- (c) Enlist different types of beams with proper sketch.
- (d) How will you determine the forces in a member by method of joints?
- (e) State perpendicular and parallel axis theorem.
- (f) Define Normal and Shear 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

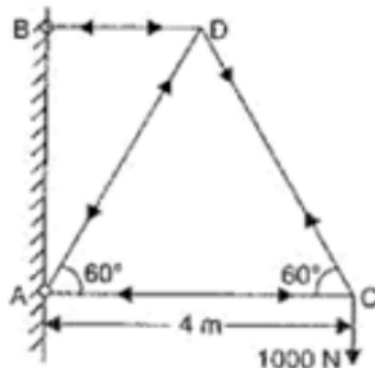
2. Attempt any *three* of the following:

10 x 3 = 30

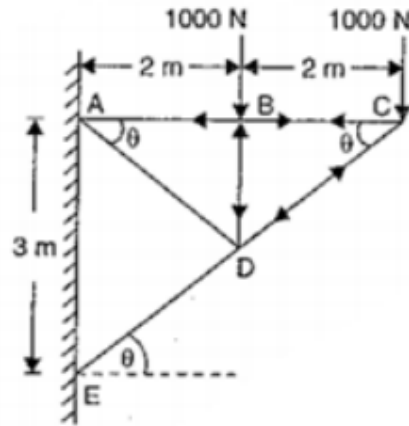
- (a) An axial pull of 35kN is acting on a bar consisting of three lengths as shown in figure. If the young's modulus (E) = 2.1×10^5 N/mm², determine i)Stresses in each section and ii)Total extension of the bar



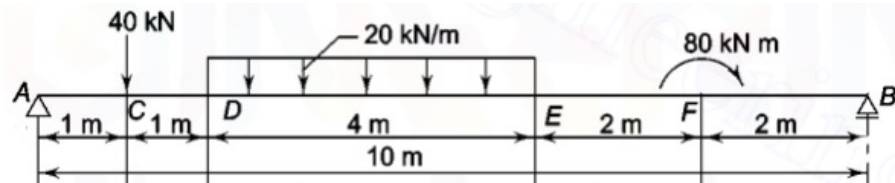
- (b) Determine the forces in all the members of the cantilever truss as shown in figure.



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

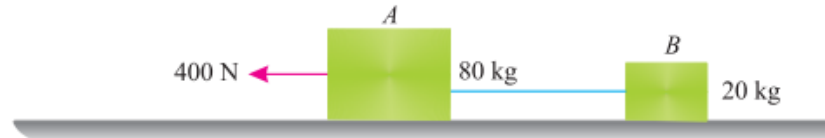


- (b) Draw Shear force and Bending moment diagram of loaded beam as shown in fig.



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 Fig. The 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 10 kg moving towards with a velocity of 8 m/s strikes with another body of 20 kg mass moving towards left with 25 m/s. Determine
- Final velocity of the two bodies
 - Loss in kinetic energy due to impact
 - 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 2000 kW at the speed of 60 RPM. If the safe allowable stress is 80 MN/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.