✓ 6/5/22

Exam.Code:0905
Sub. Code: 6649

1129

B.E. (Mechanical Engineering), First Semester
ME-101: Engineering Mechanics – I

Time allowed: 3 Hours **Max. Marks: 50**

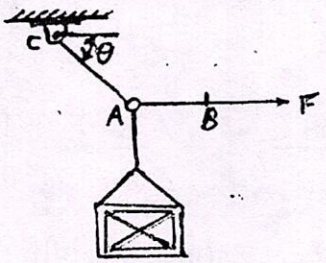
***NOTE**: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part.*

x-x-x

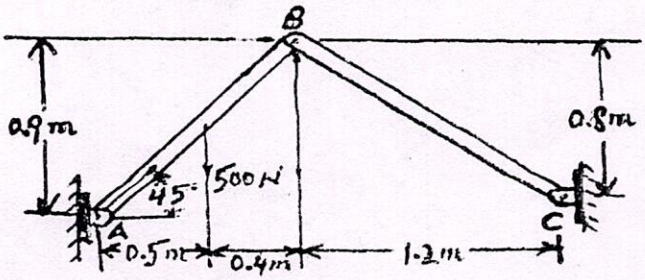
1. (a) Define following terms:
   (i) Cartesian vectors
   (ii) Dot product
   (b) State method of joints.
   (c) Give the concept of 'wedges' in context of friction.
   (d) State following:
   (i) Pappus theorem
   (ii) Goldinus theorem
   (e) State virtual work principle for a rigid body. (2 X 5=10)

PART-A

2. (a) State and prove Lami's theorem. (5)
   (b) A crate having weight of 450 N is fixed using wires AB and AC as shown in the figure. Each wire can withstand a maximum tensile load of 2500 N before its failure. If AB always remains in a horizontal direction, find the smallest inclination θ to which the crate can be fixed. (5)



3. (a) Give step by step procedure of method of joints for analyzing framed structures. (5)
   (b) Determine the horizontal and vertical components of force that pins A and C exert on the frame. (5)

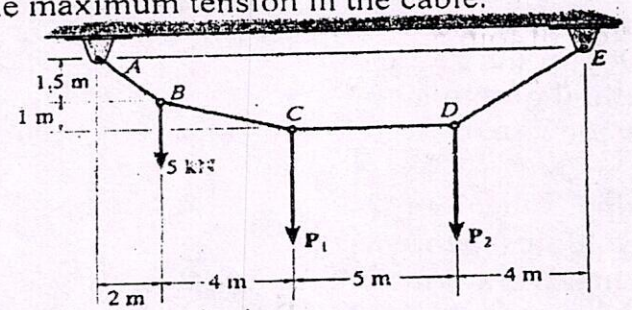


P.T.O.

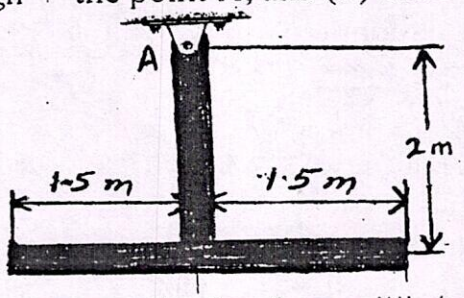
4. (a) What is dry friction? Give its characteristics. (5)
(b) A uniform ladder having a weight 'W' and length 'L' is supported at its ends against the wall surface. If the rod is on the verge of slipping when $\theta = 30°$, determine the coefficient of static friction between the ladder and wall surface. (5)

PART-B

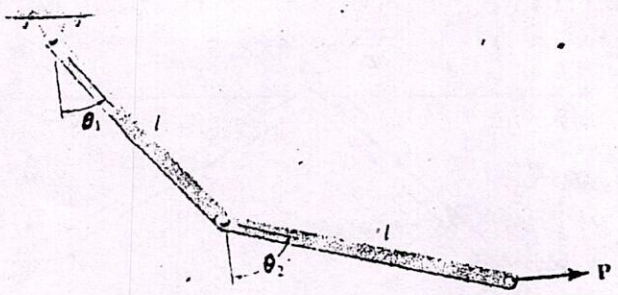
5. (a) Give the analysis of cables subjected to a distributed load. (5)
(b) Determine the forces P_1 and P_2 required to hold the cable in a position as shown in figure i.e. segment CD remains horizontal. Also, compute the sag y_D and the maximum tension in the cable. (5)



6. (a) State perpendicular axis theorem. (2)
(b) Derive the relation for moment of inertia of a triangular lamina about its centroidal axis. (3)
(c) A pendulum consists of two thin rods each having a weight of 4 kg/m. Determine the mass moment of inertia of the assembly about an axis passing (i) through the point A, and (ii) mass center of the pendulum. (5)



7. (a) Give potential energy criterion for equilibrium of a system. (5)
(b) A horizontal force acts on the end of the link as shown in figure. Determine the angles θ_1 and θ_2 for equilibrium of the two uniform links each having mass m. (5)



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