7. Write short notes on L

(a) Symmetric and anti-symmetric tensors.

(b) Axis-angle formulation and Euler angles.

(c) Free body diagram. (5×3)

Roll No. ..... Total Pages : 4

307304

December, 2019

B.Tech. (EL/EEE) - III SEMESTER

Engineering Mechanics (ELES305)

Time : 3 Hours] [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART - A

1. (a) Differentiate between the term vector and tensor. (1.5)

(b) Explain Euler's theorem. (1.5)

(c) Define the term angular velocity of a rigid body. (1.5)

(d) Differentiate between area moment of inertia and polar moment of inertia. (1.5)

(e) What do you mean by point of contraflexture. (1.5)

(f) Explain gyroscopic effect. (1.5)

(g) Define rotary motion and explain the concept of torque. (1.5)

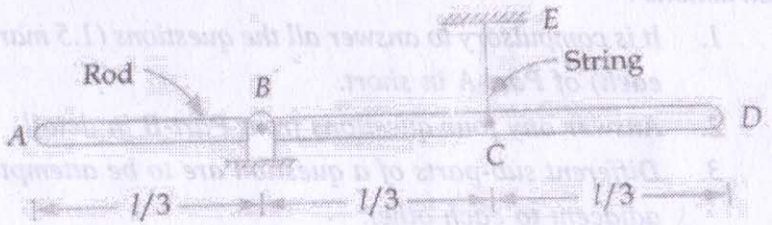
(h) State Lami's theorem. (1.5)

(i) Differentiate between bending and twisting moment. (1.5)

(j) Define the term angle of repose. (1.5)

PART - B

2. A slender rod ABCD of length l and mass m is supported in a horizontal position as shown in figure given below:



Subsequently the supporting string CE is cut. Compute the instantaneous reaction at B immediately after string has been cut. (15)

3. (a) A body of weight 100 N rests on a rough horizontal surface ($\mu = 0.3$) and is acted upon by a force applied at an angle of 30 degree to the horizontal. What force is required to just cause the body to slide over the surface? Also proceed to determine the inclination and magnitude of minimum force required to set the block into impending motion. (10)

(b) Explain and derive five term acceleration equation. (5)

4. Explain the concept of general plane motion. List some examples of such a motion. (15)

5. (a) Derive the relationship between loading, shear force and bending moment. (5)

(b) A horizontal beam 10 m long carries a uniformly distributed load of 8 kN/m together with concentrated loads of 40 kN at the left end and 60 kN at the right end. The beam is supported at two points 6 m, so chosen that reaction is the same at the each support. Determine the position of props and show the variation of shear force and bending moment over the entire length of the beam. (10)

6. (a) Derive the torsional equation for circular shaft. (8)

(b) A hollow steel shaft 5 m long is to transmit 160 kW of power at 120 r.p.m. The total angle of twist is not to exceed 2° in this length and the allowable shear stress is 50 N/mm^2. Determine the inside and outside diameters of the shaft, taking modulus of rigidity = 0.8×10^5 N/mm^2. (7)