

END TERM EXAMINATION

SECOND SEMESTER [B.TECH] MAY-JUNE 2017

Paper Code: ETME 110

Subject: Engineering Mechanics (OS)

Time: 3 Hours

Maximum Marks: 75

Note: Attempt any five questions including Q.No. 1 which is compulsory.

Q1. Answer any five: (5x5=25)

- a) State varignon theorem and laws of dry friction.
- b) What are free body diagrams? Explain in brief with suitable example. Give the conditions for equilibrium of a rigid body.
- c) What do mean by static and dynamic friction? Explain the advantages and disadvantages of friction.
- d) What is the instantaneous center of rotation of a rigid body? Explain it's utility with a suitable example.
- e) Describe the law of conservation of energy. Find the loss of energy during the impact between two rigid bodies.

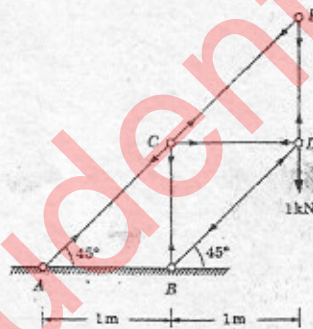
Q2. a) Derive equation for belt drive friction $\frac{T_1}{T_2} = e^{\mu\theta}$. (6)

b) A drum full of oil of density 1 kg/litre is resting against a foot step 10 cm high. Find the force required to be applied at the top of the drum to just turn it over the foot step. The drum is of 50 cm diameter, 1.5 m long and of negligible mass. (6.5)

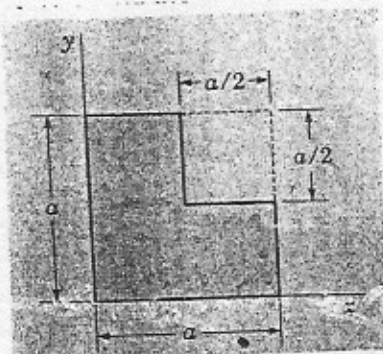
Q3. a) Explain: Angle of friction, angle of repose, cone of friction with diagram. (6)

b) Find the number of ropes required to transmit 50 kW. The maximum permissible tension in the rope is 1500N, velocity of the rope is 10 m/s and the weight of the rope is 4N/m. Assume the angle of contact as 180° and the pulley groove angle as 60° . (6.5)

Q4. Determine the axial forces in the bars of a plane truss loaded as shown. (12.5)



Q5. Find the centroid of the cross sectional area of a L-section as shown in figure. (12.5)



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- Q6. a) A car weighing 4000 N is moving at a speed of 100 m/s. The resistance to the car is largely due to air drag which is equal to $0.004 v^2$. What distance will it travel before its speed is reduced to 50 m/s? (6)
- b) A motorist is travelling on a curved road of radius 200 m at a speed of 72 km/hr. Find the normal and tangential components of acceleration.

If he applies brakes to slow down his car uniformly to a speed of 36 km/hr in 10 seconds, find the normal and tangential components of deceleration just after the brakes are applied. (6.5)

- Q7. A bullet is fired at 125 m/s and has to hit a target at a distance of 1 km and situated at a height of 200 m. Determine the angle which the bullet must be fired to hit the target in the minimum time. Determine the time of flight. (12.5)

- Q8. a) What is beam? Discuss types of beam and loading. (6)
- b) A beam simply supported at the ends A and B is carrying a uniformly distributed load of 'w' per unit length over the entire length. Draw the shear force and bending moment diagrams for the beam. (6.5)

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