(b) A motor car takes 12 second to cover 60 meters and 15 seconds to cover 105 meter. Find the uniform acceleration and its velocity at the end of 20 seconds. (8)

7. (a) Write Principal of Work and Energy. What is coefficient of restitution? (7)

(b) Determine the tension in strings and accelerations of the two blocks which are weighing 60 kg and 90 kg as shown in Fig 7. (8)

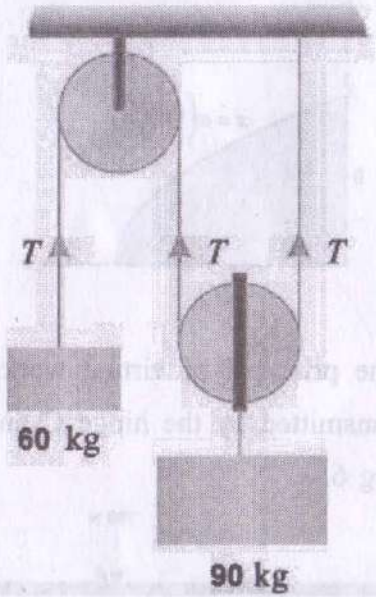

Fig. 7.

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December, 2019

B.Tech. (AE/ME/MAE) - III SEMESTER

Engineering Mechanics (ESC-203)

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.*
4. *Any missing data can be suitably assumed.*

PART - A

1. (a) 12 N and 15 N are the two forces acting on a body with 60 degree of inclination to each other, find magnitude of resultant. (1.5)

(b) What is the triangle law of force? (1.5)

(c) Find dot product of two vectors; 3i + 4j + 6k and 10k + 12i + 15j. (1.5)

(d) Write Varignon's law with suitable expression. (1.5)

(e) Write parallel axis theorem of Moment of Inertia. (1.5)

(f) Find the centroid of an equilateral triangle of 6 cm each sides. (1.5)

(g) What is limiting force of friction? (1.5)

(h) Velocity of a moving truck is changing from 10 m/s to 30 m/s in 5 seconds. If the gross load of truck is 10 tons, find the force produced by engine. (1.5)

(i) What is a conservative force? (1.5)

(j) Write the Newton's laws of motion. (1.5)

PART-B

2. (a) Determine the reaction at A and tension in the cable needed to hold the 800-N cylinder in equilibrium. Refer Fig 1. (7)

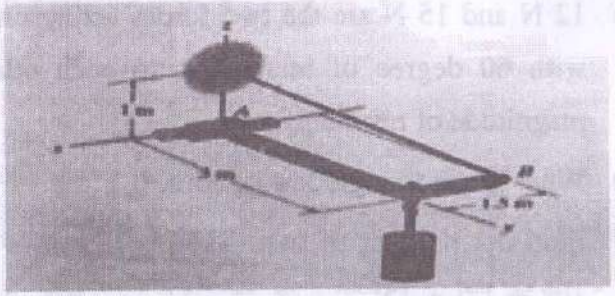


Fig 1.

(b) The forces 20 N, 30 N, 40 N, 50 N and 60 N are acting at one of the angular points of a regular hexagon, towards the other five angular points, taken in order. Find the magnitude and direction of the resultant force. (8)

Fig. 2.

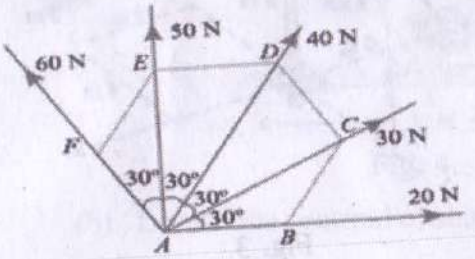


Fig. 2.

3. (a) Define Moment of a force about a point and axis. Write the law of moment of Varignon's. (7)

(b) The vertical mast supports the 4-kN force and is constrained by the two fixed cables BC and BD and by a ball-and-socket connection at A. Calculate the tension in BD. Can this be accomplished by using only one equation of equilibrium? Refer Figure 3. (8)

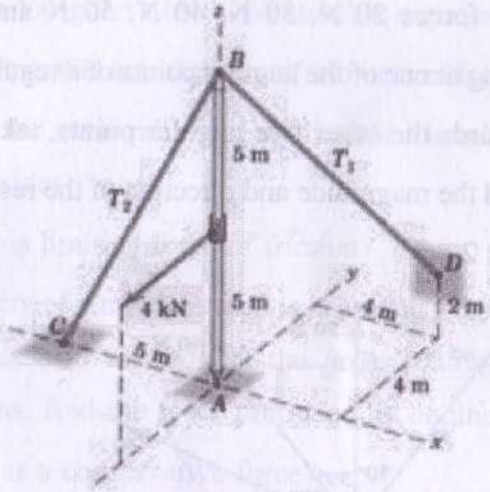


Fig. 3.

4. (a) A ball of mass 0.5 kg is attached at the end of the 3 m long string. The string will break when the Tension in the string is 25 N. What can be the maximum angular veleocity of rotation of the ball. (7)

(b) The screw of a jack is square threaded with two threads in a centimeter. The outer diameter of the screw is 5 cm. If the coefficient of friction is 0.1, calculate the force required to be applied at the end of the lever, which is 70 cm long (a) to lift a load of 4 kN, and (ii) to lower it. (8)

5. (a) A truss of span 10 meters is loaded as shown in Fig. 4. Find the forces in all the members of the truss. (7)

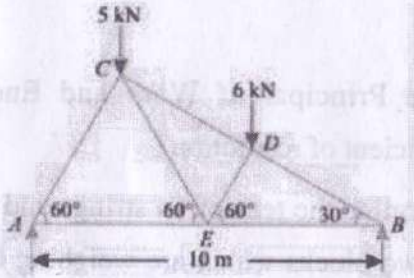
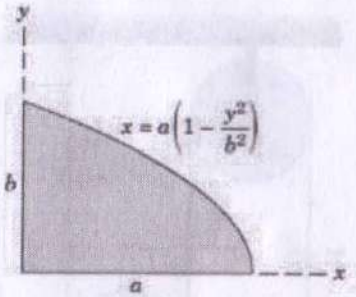


Fig. 4.

(b) Locate the centroid of shaded area of Figure 5. (8)



6. (a) Using the principal of virtual work, determine the force transmitted by the hinge C and support at B. Refer Fig 6. (7)

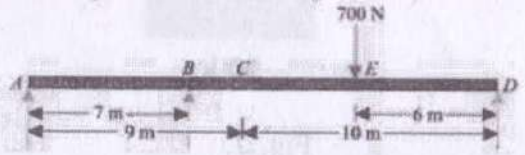


Fig 6.