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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech III Semester End Examinations(Regular) - November, 2019

Regulation: IARE – R18

ENGINEERING MECHANICS

Time: 3 Hours

(Common to CE | ME)

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. (a) Explain the method of resolution for determining the resultant force of a Force system. [7M]
- (b) The following forces act at a point: i) 20 N inclined at 30° towards North of East ii) 25 N towards North,iii) 30 N towards North West iv) 35 N inclined at 40° towards South of West. Find the magnitude and direction of the resultant force [7M]
2. (a) Explain the procedure to find the resultant of several forces acting at a point. [7M]
- (b) A string ABCD, attached to fixed points A and D has two equal weights of 1000 N attached to it at B and C. The weights rest with the portions AB and CD inclined at angles as shown in Figure 1. Find the tensions in the portions AB, BC and CD of the string, if the inclination of the portion BC with the vertical is 120° . [7M]

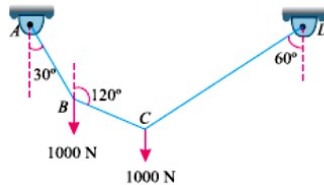


Figure 1

UNIT – II

3. (a) Obtain an expression for the minimum effort required along the inclined plane to keep a body in equilibrium position when it is at point of sliding downwards on a inclined plane. [7M]
- (b) Screw jack has a square thread of 75 mm mean diameter and 15 mm pitch. The load on the jack revolves with the screws. The coefficient of friction at the screw thread is 0.05. Find the tangential force to be applied to the jack at 360 mm radius, so as to lift a load of 6 kN weight. [7M]
4. (a) Define limiting friction and state Coulomb's laws of dry friction. [7M]
- (b) A beam AB of span 3m, overha nging on both sides is loaded as shown in Figure 2. Determine the reactions at the supports A and B. [7M]

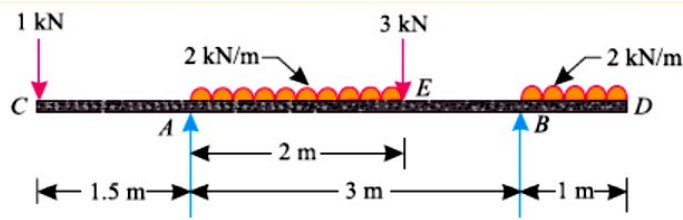


Figure 2

UNIT – III

5. (a) Locate the centroid of a semicircle from its diametral axis using the method of integration. [7M]
 (b) Find the moment of inertia about the centroidal axes XX and YY of the section shown in Figure 3. [7M]

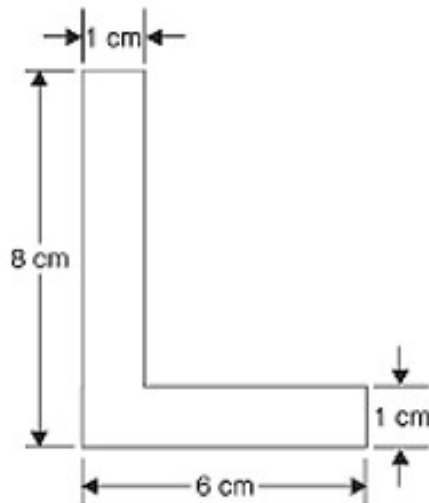


Figure 3

6. (a) State and explain Pappus-Guldinus theorems for surface of revolution and volume of revolution. [7M]
 (b) A force of 500N is acting at 30° to the horizontal on a block of mass 50kg resting on a horizontal surface. Determine the velocity after the block has traveled a distance of 10m. Coefficient of kinetic friction is 0.5. [7M]

UNIT – IV

7. (a) State D'Alembert's principle.. Compare Newton's second law with D'Alembert's principle. [7M]
 (b) A burglar's car had a start with an acceleration of 2 m/s^2 . A police vigilant party came after 5 seconds and continued to chase the burglar's car with a uniform velocity of 20 m/s. Find the time taken, in which the police van will overtake the burglar's car. [7M]

8. (a) Define the terms velocity and acceleration. Explain various types of impacts using standard terminologies. [7M]
- (b) A man weighing W newton entered a lift which moves with an acceleration of ' a ' m/s^2 . Find the force exerted by a man on the floor of lift when i) Lift is moving downward ii) Lift is moving upward. [7M]

UNIT – V

9. (a) Define simple harmonic motion. Write the expression for equivalent stiffness of a spring system when springs are arranged in series. [7M]
- (b) A body moving with simple harmonic motion has amplitude of 1 m and period of oscillation of 2 seconds. What will be its velocity and acceleration 0.4 second and after passing an extreme position. [7M]
10. (a) Obtain the expression for the time period of a simple pendulum and compound pendulum. [7M]
- (b) A weight of 10N attached to a spring oscillates at a frequency of 60 oscillations per minute. If the maximum amplitude is 30mm, find the tension induced in the spring. Also find the spring constant and the maximum velocity in the spring [7M]