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BIME-031

B.Tech. – VIEP – MECHANICAL ENGINEERING

(BTMEVI)

00992

Term-End Examination

December, 2017

BIME-031 : KINEMATICS AND DYNAMICS OF MACHINES

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Use of scientific calculator is allowed.*

1. An applied force of 1500 N is required to be able to move a body up with uniform velocity upon an inclined plane of angle 12° with the force acting parallel to the plane. When the angle of the inclined plane is increased to 15°, the applied force increases to 1700 N. Determine the mass of the body and the coefficient of friction between the body and the surface of the inclined plane. *10*

2. Two pulleys, one 45 cm diameter and the other 20 cm diameter are on parallel shafts 195 cm apart and are connected by a crossed belt. Find the approximate length of the belt required and the angle of contact between the belt and each pulley. Determine the power transmitted by the belt when the larger pulley rotates at 200 revolutions/minute. The maximum permissible tension in the belt is 1 kN, and the coefficient of friction between the belt and the pulley is 0·25. *10*

3. Explain the construction and operation of a prony brake or a rope brake absorption dynamometer. *10*

4. Find an expression for the minimum number of teeth on a pinion in order to avoid interference. *10*

5. State the laws of static and dynamic friction. Prove that the angle of friction is equal to the angle of the inclined plane, when a solid body of weight W placed on the inclined plane, is about to slide down. *10*

6. A cam is to give the following motion to a knife-edge follower :

   (i) Outstroke during 60° of cam rotation

   (ii) Dwell for the next 30° of cam rotation

   (iii) Return stroke during 60° of cam rotation

   (iv) Dwell for the remaining 210° of cam rotation

   The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and the return stroke. Draw the profile of the cam, when the axis of the follower passes through the axis of the cam shaft. *10*

7. Define the terms Spin and Precession. Derive the expression for Gyroscopic Couple. *10*

8. In a thrust bearing, the external and internal radii of the contact surfaces are 210 mm and 160 mm respectively. The total axial load is 60 kN and the coefficient of friction between the surfaces is 0·05. The shaft is rotating at 380 rpm. Intensity of pressure should not exceed 350 kN/m^2. Calculate : *10*

   (a) Power lost in overcoming friction

   (b) Number of collars required for thrust bearing

9. Write short notes on the following : *10*

   (a) Slip and Creep in a Belt Drive

   (b) Epicyclic Gear Train