| BIME-031 |

B.Tech. – VIEP – MECHANICAL ENGINEERING (BTMEVI)
Term-End Examination
December, 2015

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 permitted.*

1. A conical pivot with cone angle as 120°, supports a vertical shaft of diameter 300 mm. It is subjected to a load of 20 kN. The coefficient of friction is 0·05 and the speed of the shaft is 210 rpm. Calculate the power lost in friction assuming (a) uniform pressure, (b) uniform wear. *10*

2. An open belt drive connects two pulleys 120 cm and 50 cm diameters on parallel shafts 4 m apart. The maximum tension in the belt is 1855·3 N. The coefficient of friction is 0·3. The driver pulley of diameter 120 cm runs at 200 rpm. Calculate

    (a) the power transmitted, and

    (b) the torque on each of the two shafts. *10*

3. The brake drum of a single block brake is rotating at 500 rpm in the clockwise direction. The diameter of the drum is 400 mm and the single block brake is of the type as shown in Figure 1.
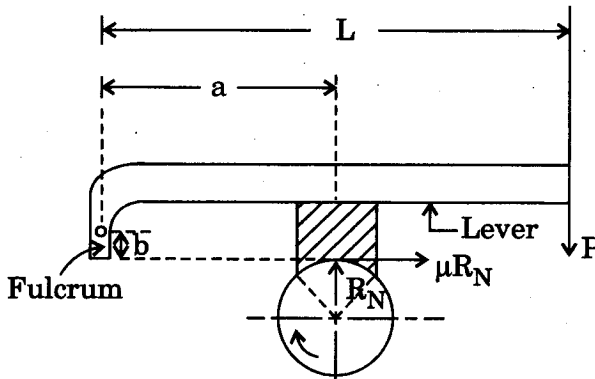

Figure 1

The force required at the end of the lever to apply the brake is 300 N. If the angle of contact is 30°, and L = 1 m, a = 300 mm and b = 25 mm, then determine the braking torque. The coefficient of friction is equal to 0·3.　　　*10*

4. Describe rope brake dynamometer with a neat sketch.　　　*10*

5. Derive an expression for the velocity of sliding between a pair of involute teeth. State the advantages of involute profile as a gear teeth profile.　　　*10*

6. Define the terms spin and precision. Explain the gyroscopic effect on a two-wheeler vehicle. *10*

7. What do you understand by 'angle of repose' ? Prove that the angle of repose is equal to the friction angle. *10*

8. Draw the profile of a cam operating a knife-edge follower, when the axis of the follower passes through the axis of cam shaft, from the following data :

(a) Follower to move outwards through 40 mm during 60° of the cam rotation.

(b) Follower to dwell for the next 45°.

(c) Follower to return to its original position during next 90°.

(d) Follower to dwell for the rest of the cam rotation.

The displacement of the follower is to take place with simple harmonic motion during both the outward and the return strokes. The least radius of the cam is 50 mm. If the cam rotates at 300 rpm, determine the maximum velocity and acceleration of the follower during the outward stroke and return stroke. *10*

9. The number of teeth on each of the two equal spur gears in mesh is 40. The teeth have 20° involute profile and the module is 6 mm. If the arc of contact is 1·75 times the circular pitch, find the addendum. *10*

10. Write short notes on any *two* of the following : *10*

(a) Friction circle in journal bearing

(b) Circular cam with flat faced follower

(c) Interference and undercutting in involute gear teeth