

**B.Tech. MECHANICAL ENGINEERING
(BTMEVI)**

Term-End Examination

December, 2012

**BIME-031 : KINEMATICS AND DYNAMICS OF
MACHINES**

Time : 3 hours

Maximum Marks : 70

*Note: Attempt **any seven** questions. All the questions are to be answered in English Language only. Use of scientific calculator is permitted. All questions carry equal marks.*

1. In a thrust bearing the external and internal radii of the contact surfaces are 210mm and 160mm respectively. The total axial load is 60 kN and co-efficient of friction = 0.05. The shaft is rotating at 380 r.p.m. Intensity of pressure is not to exceed 350 kN/m². calculate :
- (i) Power lost in overcoming the friction
 - (ii) Number of collars required for the thrust bearing.

2. Show that length (L) of an open belt drive is given by: 10

$$L = \pi(r_1 + r_2) + \frac{(r_1 - r_2)^2}{x} + 2x$$

When x = distance between centres of the two pulleys.

r_1 = Radius of the larger pulley

r_2 = Radius of the smaller pulley

L = Total length (approximate)

3. A simple band brake is applied to a rotating drum of diameter 50 cm. The angle of lap of the band on the drum is 270° . One end of the band is attached to a fulcrum pin of the lever and other end is attached to a pin 100 mm from the fulcrum. If the co-efficient of friction is 0.25 and a braking force of 90 N is applied at a distance of 60 cm from fulcrum. Find the braking torque when the drum rotates in the anticlock wise direction. 10
4. Describe with the help of a neat sketch, construction and working of a rope brake absorption dynamometer. 10
5. Draw the displacement, velocity and acceleration diagrams for a follower when it moves with simple Harmonic motion. Also derive the expression for velocity and acceleration during outstroke and return stroke of the follower. 10

6. Draw the profile of a cam operating a knife edge follower when the axis of the follower is offset by 20 mm from the axis of the cam shaft with the following data : 10
- (a) Follower to move outwards through 40 mm during 60° of cam rotation
 - (b) Follower to dwell for the next 45°
 - (c) Follower return to its original position during next 90° .
 - (d) Follower to dwell for the rest of the cam rotation.
7. State and prove the law of gear tooth action for constant velocity ratio and show how the involute teeth profile satisfies the condition. 10
8. Find an expression for the minimum number of teeth on the pinion in order to avoid interference. 10
9. Explain the term spin and precession. Derive expression of gyroscopic couple. 10
10. (a) With a neat sketch explain working of an epicyclic gear train with a Sun and planet gear. 10
- (b) Explain angle of repose and state the law of solid friction.