

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

**Term-End Examination**

**June, 2017**

00674

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

*Time : 3 hours*

*Maximum Marks : 70*

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

1. State and prove the law of gear tooth action for constant velocity ratio. Show how the involute teeth profile satisfies the condition. 14
  
2. Derive an expression for determining the minimum number of teeth on the pinion in order to avoid interference. 14
  
3. The collar thrust bearing is rotating at 150 rpm carrying an end thrust of 50 kN. It has an outside radius 25 cm and inner radius of 15 cm. Determine the coefficient of friction of the lubricant if the frictional power loss should not exceed 3.0 kW. 14

4. With the help of a neat sketch, describe internal shoe brakes used in automobiles. 14

5. Construct a cam profile for a follower having the following information : 14

- (a) Base circle diameter of cam = 30 mm
- (b) Cam rotates at 1200 rpm clockwise
- (c) Roller follower diameter = 10 mm
- (d) Roller follower axis is offset right = 5 mm
- (e) Outward stroke = 25 mm with uniform acceleration and retardation to  $120^\circ$
- (f) Dwell at maximum position of follower =  $60^\circ$
- (g) Return stroke =  $90^\circ$  with uniform acceleration and retardation

6. A belt drive is required to transmit 12 kW from a motor running at 625 rpm. The belt is 12 mm thick and has a mass density of  $0.001 \text{ gm/mm}^3$ . Safe stress in the belt is not to exceed  $2.5 \text{ N/mm}^2$ . Diameter of the driving pulley is 250 mm and the speed of the driven pulley is 220 rpm. The shafts are 1.25 m apart. The coefficient of friction is 0.25. Determine the width of the belt. 14

7. Describe the effect of a gyroscopic couple due to rotating parts in a four-wheel vehicle turning right. Discuss the effect of the gyroscopic couple on the stability of an automobile. 14

8. Write short notes on the following :  $4 \times 3 \frac{1}{2} = 14$

- (a) Condition for Maximum Power Transmission in a Belt Drive
  - (b) Sun and Planet Gear
  - (c) Gear Tooth Profile
  - (d) Band and Block Brake
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