

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

Term-End Examination

December, 2014

00955

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

Time : 3 hours

Maximum Marks : 70

*Note : Attempt any **five** questions. All questions carry equal marks.*

1. What are the different types of friction ? Explain with suitable examples. Deduce an expression for the radius of friction circle in terms of the radius of the journal and the angle of friction. 14

2. A 100 mm wide and 100 mm thick belt transmits 5 kW between two parallel shafts. The distance between the shaft centres is 1.5 m and the diameter of the smaller pulley is 440 mm. The driving and the driven shafts rotate at 60 rpm and 150 rpm respectively. Find the stress in the belt if the two pulleys are connected by : (i) an open belt, and (ii) a cross belt. The coefficient of friction is 0.22. 14

3. Describe with the help of a neat sketch, the principle of operation of an internal expanding shoe brake. Derive the expression for the braking torque. 14
4. In a belt transmission dynamometer, the driving pulley rotates at 300 rpm. The distance between the centres of the driving pulley and the dead mass is 800 mm. The diameter of each of the driving as well as the intermediate pulley is equal to 360 mm. Find the value of the dead mass required to maintain the lever in a horizontal position when the power transmitted is 3 kW. Also find its value when the belt just begins to slip on the driving pulley, μ being 0.25 and the maximum tension in the belt 1200 N. 14
5. What is a cam ? With the help of neat sketches, describe the various types of cams. 14
6. Two gears in mesh have a module of 8 mm and a pressure angle of 20° . The larger gear has 57 teeth while the pinion has 23 teeth. If the addenda on pinion and gear wheel are equal to one module, find
- (a) the number of pairs of teeth in contact
 - (b) the angle of action of the pinion and the gear wheel
 - (c) the ratio of the sliding to rolling velocity at
 - (i) the beginning of contact
 - (ii) the pitch point
 - (iii) the end of contact
- 14

7. An aeroplane flying at 240 km/hr turns towards the left and completes a quarter circle of 60 m radius. The mass of the rotary engine and the propeller of the plane amounts to 450 kg with a radius of gyration of 320 mm. The engine speed is 2,000 rpm clockwise when viewed from the rear. Determine the gyroscopic couple on the aircraft and state its effect. 14
8. Discuss the effect of gyroscopic couple on the stability of an automobile. 14
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