No. of Printed Pages : 3 + Drawing Sheet **BIME-031**

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B.Tech. MECHANICAL ENGINEERING (BTMEVI)

Term-End Examination December, 2011

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.*

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1. For a flat belt, prove that $\frac{T_1}{T_2} = e^{\mu\theta}$, **10**

Where T_1 = Tension in the tight side of the belt,

T_2 = Tension in the slack side of the belt,

μ = Coefficient of friction between the belt and the pulley, and

θ = Angle of contact between the belt and pulley (in radians).

2. An effort of 1500N is required to just move a certain body up an inclined plane of angle 12°, force acting parallel to the plane. If the angle of inclination is increased to 15°, then the effort required is 1720 N. Find the weight of the body and the coefficient of friction of the surface. **10**

3. Show that, in a band and block brake, the ratio of the maximum and minimum tensions in the brake straps is : **10**

$$\frac{T_o}{T_n} = \left[\frac{1+\mu \tan \theta}{1-\mu \tan \theta}\right]^n$$

Where, T_o = Maximum tension

T_n = Minimum tension

μ = Coefficient of friction between the blocks and drum.

θ = Angle subtended by each block at the centre of the drum.

4. A bicycle and rider of mass 100 kg are travelling at the rate of 16 km/h on a road. A brake is applied to the rear wheel which is 0.9 m in diameter and this is the only resistance acting. How far will the bicycle travel and how many turns will it make before it comes to rest ? The pressure applied on the brake is 100 N and $\mu = 0.05$. **10**

5. Explain with sketches the different types of cams and followers. **10**

6. Draw the displacement, velocity and acceleration diagrams for a follower when it moves with simple harmonic motion. Derive the expression for velocity and acceleration during outstroke and return stroke of the follower. **10**

7. Derive an expression for the length of the arc of contact in a pair of meshed spur gears. **10**

8. Differentiate simple, compound, and epicyclic gear trains. What are the special advantages of epicyclic gear trains over simple gear trains ? **10**

9. Explain the effect of the gyroscopic couple on the reaction of the four wheels of a vehicle negotiating a curve. **10**

10. Write short notes on the followings : **2x5=10**

    (a) Journal bearing

    (b) V-belt drive.