B.Tech. MECHANICAL ENGINEERING (BTMEVI)

Term-End Examination

December, 2013

BIME-031 : KINEMATICS AND DYNAMICS OF MACHINES

Time : 3 hours *Maximum Marks : 70*

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

1. The collar thrust bearing rotating at 150 rpm carrying an end thrust of 50 kN. It has an outside radius of 25 cm and inner radius of 15cm. Determine the co-efficient of friction of the lubricant if the frictional power loss should not exceed to 2.5 kW. **10**

2. Determine the maximum power transmitted by an open belt drive, embracing a pulley by 120°, if the maximum stress in the belt is not to exceed 140 N/cm². What is the corresponding linear speed of the belt ? Specification of belt are : **10**

    Width = 10 cm

    Thickness = 6 mm

    Density = 0.97 gm/cm³

    Assume μ = 0.3 .

3. A brake drum as shown in fig 1. of 1.0 m diameter **10** has shoe contact angle of 40°. It can absorb a torque of 200 Nm at 400 rpm. The Co-efficient of friction is 0.35. Determine :

   (a) The normal force on the shoe.

   (b) The force to be applied for clockwise rotation.

   (c) The force to be applied for counter - clockwise rotation.

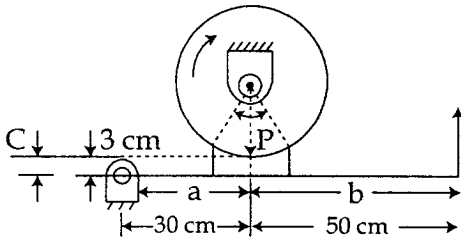   (d) The value of dimension C for self locking.

Fig. 1

4. With neat sketch describe tangent cam with roller **10** follower.

5. Derive an expression for minimum number of **10** teeth on a Gear Wheel to avoid interference as :

$$T = \frac{2a_W}{\left\{1 + \dfrac{1}{G}\left(\dfrac{1}{G} + 2\right)\sin^2\phi\right\}^{\frac{1}{2}} - 1}$$

Where   T = number of teeth of the gear wheel

t = number of teeth on the pinion

$$G = \text{gear ratio} = \frac{T}{t}$$

ϕ = pressure angle

m = module

a_w = factor the addendum to be multiplied to avoid interference.

6. Classify the gear trains. Describe reverted and   **10**
epicyclic gear trains.

7. Mass of the engine fitted in an aeroplane is   **10**
400 kg. The radius of gyration of the revolving
masses is 30 cm. The sense of rotation of masses
is clockwise as viewed from the front of the
engine and its speed is 2000 rpm. ·Determine the
magnitude and direction of the gyroscopic couple
acting on the aeroplane when its speed of flight
is 125 km/hr in radius of circle is 30 m in anti-
clockwise direction as viewed from the bottom.

8. Differentiate between path of contact and arc of   **10**
contact with the help of diagram for gear teeth
have involute profile.

9. Derive an expression for displacement of follower **10** having SHM and corresponding velocity as

$$v = \frac{\pi}{\theta_0} \frac{S}{2} \omega , \sin\left(\frac{\pi\theta}{\theta_0}\right)$$

where, S = stroke length of follower

θ = cam angle

θ_0 = angle of action

ω = angular velocity of cam.

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

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