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

Term-End Examination

ロ0651   **June, 2019**

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. (a) Discuss briefly the various types of friction experienced by a body.   7

   (b) Discuss briefly the various types of belts used for the transmission of power.   7

2. (a) An open belt drive connects two pulleys, 1·2 m and 0·5 m diameter, on parallel shafts 3·6 m apart. The belt has a mass of 0·9 kg/m of length, and the maximum tension in it is not to exceed 2 kN. The larger pulley is at 200 rev/min (rpm). Calculate the torque on each of the two shafts and the power transmitted. Take $\mu = 0·3$.   10

   (b) State precisely, reasons for V-belt drive being preferred over flat belt drive.   4

3. (a) Describe with the help of neat sketch, the principle of operation of an internal expanding shoe brake. *10*

   (b) Distinguish between brakes and dynamometer. *4*

4. (a) A simple band brake is operated by a lever of length 500 mm. The brake drum has a diameter of 500 mm and the brake band embraces 5/8 of the circumference. One end of the band is attached to the fulcrum. If the effort applied to the end lever is 2 kN and the coefficient of friction is 0·25, find the maximum braking torque on the drum. *10*

   (b) Briefly describe the simple harmonic and parabolic motion of the follower. *4*

5. Draw the profile of a cam which will give lift of 37·5 mm to a roller follower. The diameter of the roller is 25 mm and the line of stroke is off-set by 20 mm from the axis of the cam. The outstroke of the follower takes place with simple harmonic motion during 72° of cam rotation, followed by a period of rest during 18° of cam rotation. The follower then returns with equal uniform acceleration and retardation during 54° of cam rotation. The minimum radius of the cam is 50 mm. If the cam rotates at a uniform speed of 240 rpm, find the maximum acceleration during outstroke and return stroke. *14*

6. (a) State and prove the law of gearing. 7

(b) Explain briefly the difference between simple, compound, reverted and epicyclic gear trains. What are the advantages of epicyclic gear trains ? 7

7. (a) Explain the effect of the gyroscopic couple on the reaction of the four wheels of vehicle. 7

(b) The turbine rotor of mass 1000 kg rotates at 2000 rpm clockwise looking from stern, the vessel pitches with an angular velocity of 0·5 rad/s. Calculate the gyroscopic couple during the rise of bow. Assume radius of gyration of the rotor as 250 mm. 7

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

(a) Stability of aeroplanes

(b) Under cutting in involute gear teeth

(c) Circular cams with flat faced follower

(d) Transmission dynamometers

(e) Uniform pressure and Uniform wear

(f) Condition for maximum power transmission for belt drive