B.Tech. – VIEP – MECHANICAL ENGINEERING
(BTMEVI)
Term-End Examination

□□9□6 **June, 2015**

BIME-031 : KINEMATICS AND DYNAMICS OF MACHINES

Time : 3 hours *Maximum Marks : 70*

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

1. In a thrust bearing, the external and the internal diameters of the contacting surfaces are 320 mm and 200 mm respectively. The total axial load is 80 kN and the intensity of pressure is 350 kN/m². The shaft rotates at 400 rpm. Taking the coefficient of friction as 0·06, calculate the power lost in overcoming the friction. Also find the number of collars required for the bearing. *14*

2. A bell drive is required to transmit 10 kW from a motor running at 600 rpm. The belt is 12 mm thick and has a mass density of 0·001 g$_m$/mm³. Safe stress in the belt is not to exceed 2·5 N/mm². Diameter of the driving pulley is 250 mm and the speed of the driven pulley is 220 rpm. The two shafts are 1·25 m apart. The coefficient of friction is 0·25. Determine the width of the belt. *14*

3. Describe the construction and operation of a Prony brake absorption dynamometer with its practical examples. *14*

4. A band and block brake having 12 blocks, each of which subtends an angle of 16° at the centre is applied to a rotating drum of diameter 600 mm. The blocks are 75 mm thick. The drum and the flywheel mounted on the same shaft have a mass of 1800 kg and have a combined radius of gyration of 600 mm. The two ends of the band are attached to pins on the opposite sides of the brake fulcrum at distances of 40 mm and 150 mm from the fulcrum. If a force of 250 N is applied at a distance of 900 mm from the fulcrum, find

(a) the maximum braking torque,

(b) the angular retardation of the drum,

(c) the time taken by the system to be stationary from the rated speed of 300 rpm.

Take coefficient of friction between the blocks and the drum as 0·3. *14*

5. Draw the profile of a cam operating a roller type reciprocating follower and with the following data :

Minimum radius of cam = 25 mm, Lift = 30 mm, Roller diameter = 15 mm.

The cam lifts the follower for 120° with simple harmonic motion followed by a dwell period of 30°. Then the follower lowers down during 150° of the cam rotation with uniform acceleration and deceleration followed by a dwell period. If the cam rotates at a uniform speed of 150 rpm, calculate the maximum velocity and acceleration of the follower during the descent period. *14*

6. What are the different types of followers ? Explain with sketches the different types of motions performed by the follower. *14*

7. Following data relate to two meshing involute gears :

Number of teeth on the gear wheel = 60, Pressure angle = 20°, Gear ratio = 1·5, Speed of the gear wheel = 100 r.p.m, Module = 8 mm. The addendum on each wheel is such that the path of approach and the path of recess on each side are 40% of the maximum possible length each. Determine the addendum for the pinion and the gear, and the length of the arc of contact. *14*

8. Explain with a neat sketch the sun and planet wheel. How is the velocity ratio of epicyclic gear train determined ? Explain. *14*

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