Code No: ME1514 GEC-R14 II B. Tech II Semester Supplementary Examinations, December 2017 DYNAMICS OF MACHINES

(Mechanical Engineering)

Note: All Questions from **PART-A** are to be answered at one place. Answer any **FOUR** questions from **Part-B**. All Questions carry equal Marks.

PART-A

- 1. What is meant by self locking and self energised brake?
- 2. What are conditions for a body to be in equilibrium under the action of two forces and a torque?
- 3. What do you mean by gyroscopic couple? Write a relation for its magnitude.
- 4. What is meant by static and dynamic unbalance in machinery?
- 5. What do you mean by partial balancing in reciprocating engines?
- 6. Define free, damped and forced vibrations.

Time: 3 Hours

PART-B

- 1. a) Explain any one type of transmission dynamometer. (4M)
 - b) 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 5/8th of the circumference. One end of the band is attached to the fulcrum of the lever while the other end is attached to a pin on the lever 100 mm from the fulcrum. If the effort applied to the end of the lever is 2 kN and the coefficient of friction is 0.25, find the maximum braking torque on the drum. (8M)
- a) Define the terms coefficient of fluctuation of energy and coefficient of fluctuation of speed. Explain the significance of these terms. (4M)
 - b) A punching machine is required to punch 2 cm diameter holes in 1.5cmthick plates having ultimate shear stress of 320 N/sq.mm. If 30 holes are to be punched per minute and if punching operation requires 1/10th of a second, find moment of inertia of a suitable flywheel in order that the speed lies between 141 and 159 rpm. (8M)
- 3. The arms of a Proell governor are 300mm long. The upper arms are pivoted on the axis of rotation, while the lower arms are pivoted at a radius of 40mm. Each ball weighs 50 N and is attached to an extension 100 mm long of the lower arm; the central weight is 600 N. At the minimum radius of 160 mm the extension to which balls are attached are parallel to the governor axis. Find the equilibrium speed corresponding to a radius of 160 mm. (12M)

11.1.1.10

Max. Marks: 60

 $6 \times 2 = 12M$

 $4 \times 12 = 48 \mathbf{M}$

4. Four masses m_1 , m_2 , m_3 and m_4 having 100, 175, 200 and 25 kg are fixed to cranks of 20 cm radius and revolve in places 1, 2, 3 and 4. The angular position of the cranks in planes 2, 3 and 4 with respect to the crank in plane 1 are 75^0 , 135^0 and 200^0 taken in the same sense. The distance of planes 2, 3 and 4 from plane 1 are 60 cm, 186 cm and 240 cm respectively. Determine the position and magnitude of the balance mass at a radius of 60 cm in plane L and M located at middle of the plane 1 and 2 and the middle of the planes 3 and 4 respectively.

(12M)

- 5. In an inline six cylinder engine working on two stroke cycle, the cylinder center lines are spaced at 600 mm. In the end view the cranks are 60^{0} apart and in the order 1-4-5-2-3-6. The stroke of each piston is 400 mm and the connecting rod length is 1m. The mass of the reciprocating parts is 200kg per cylinder and that of rotating parts 100 kg per crank. The engine rotates at 300 rpm. Examine the engine for the balance of primary and secondary forces and couples. Find the maximum unbalanced forces and couples. (12M)
- 6. a) Explain briefly the phenomenon of the whirling of shafts. (4M)

b) A steel shaft 6 cm diameter and 50 cm long fixed at one end carries a flywheel of mass 100 kg and radius of gyration 30 cm at its free end. Find the frequency of free longitudinal and transverse vibration. Take E=200GN /m² (8M)
