

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 4076

Roll No.

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### B. Tech.

(SEM. V) ODD SEMESTER THEORY EXAMINATION 2010-11

### DYNAMICS OF MACHINE

Time : 3 Hours

Total Marks : 100

- Note :**
- (1) Attempt *all* questions.
  - (2) Marks are indicated against each question part.
  - (3) Assume missing data suitably, if any.

1. Attempt any *four* of the following : (5×4=20)

- What are free body of a mechanism ? Explain in brief.
- What is meant by piston effort and make effort ?
- State and explain D Alembert's principle.
- What do you mean by dynamically equivalent system ? Explain.
- Define the terms coefficient of fluctuation of energy and coefficient of fluctuation of speed.
- What is flywheel ? What is its use ?

Attempt any *two* of the following : (10×2=20)

- Three masses of 8 kg, 12 kg and 15 kg attached at radial distances of 80 mm, 100 mm and 60 mm respectively to a disc on a shaft are in complete balance. Determine the angular position of the masses 12 kg and 15 kg relative to 8 kg mass.

- (b) The following data relate to a single cylinder reciprocating engine :

Mass of reciprocating parts = 40 kg

Mass of revolving parts = 30 kg at crank radius

Speed = 150 rpm

Stroke = 350 mm

If 60% of the reciprocating parts and all the revolving parts are to be balanced, determine :

- (i) the balance mass required at a radius of 320 mm  
(ii) the unbalanced force when the work has turned  $45^\circ$  from the top dead centre.

- (c) Explain the method of finding the counter masses in two planes to balance the dynamic unbalance of rotating masses.

3. Attempt any *two* of the following :— (10×2=20)

- (a) What is a Clutch ? Make a sketch of a single plate clutch and describe its working.

- (b) A countershaft is to be driven at 240 rpm from a driving shaft rotating at 100 rpm by an open belt drive. The diameter of the driving pulley is 480 mm. The distance between the centre line of shafts is 2 m. Find the width of the belt to transmit 3 kN of power if the permissible stress in tension is 15 N/mm width of the belt. Take  $\mu = 0.3$ .

- (c) What is the advantage of self-expanding shoe brake ? Derive the relation for the friction torque for such a brake.

4. Attempt any *two* of the following :—

- (a) Sketch a Hatnell governor. Describe its function and deduce a relation to find the stiffness of the spring. (10)
- (b) Explain the terms sensitiveness, hunting and stability relating to governors. (10)
- (c) (i) What is meant by effort and power of a governor? (4)
- (ii) Explain the working principle of an inertia governor with the help of a neat sketch. (6)

5. Attempt any *two* of the following :—

- (a) (i) What do you mean by spin, precession and gyroscopic planes? (6)
- (ii) Explain what is meant by applied torque and reaction torque. (4)
- (b) Explain the gyroscopic effect on four wheeled vehicles. (10)
- (c) A flywheel having a mass of 20 kg and a radius of gyration of 300 mm is given a spin of 500 rpm about its axis which is horizontal. The flywheel is suspended at a point 250 mm from the plane of rotation of the flywheel. Find the rate of precession of the wheel. (10)