Printed Pages—3 **TME503**

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

PAPER ID : 4076 **Roll No.**

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)**

(a) What are free body of a mechanism ? Explain in brief.

(b) What is meant by piston effort and make effort ?

(c) State and explain D Alembert's principle.

(d) What do you mean by dynamically equivalent system ? Explain.

(e) Define the terms coefficient of fluctuation of energy and coefficient of fluctuation of speed.

(f) What is flywheel ? What is its use ?

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

(a) 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° 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 safe permissble 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)**