Printed Pages:03 **Sub Code:NME 603**

Paper Id: 140262 **Roll No.** | | | | | | | | | | |

B. TECH.
(SEM-VI) THEORY EXAMINATION 2018-19
DYNAMICS OF MACHINES

Time: 3 Hours *Total Marks: 100*

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

a. Explain coefficient of fluctuation of energy.
b. What is the principle of virtual work?
c. What is balancing and why is necessary?
d. What is the difference between unbalanced force due to reciprocating mass and rotating mass?
e. What do you understand by isochronism of governor?
f. Define 'coefficient of insensitivity'.
g. Give various classifications of transmission dynamometers
h. Distinguish between brakes and dynamometers.
i. Explain the term under damping and over damping.
j. Name the different axis associated with gyroscope.

SECTION B

2. Attempt any *three* of the following: **10x3=30**

a. Write the function of flywheel. Define the term coefficient of fluctuation of speed. A flywheel with a mass of 3 KN has a radius of gyration of 1.6 m. Find the energy stored in the flywheel when its speed increases from 315 rpm to 340 rpm.

b. A porter governor has all four arms 250 mm long. The upper arms are attached on the axis of rotation and the lower arms are attached to the sleeve at a distance of 30 mm from the axis. The mass of each ball is 5 kgand the sleeve has a mass of 50 kg. The extreme radii of rotation are 150 mm and 200 mm. Calculate the range of speed of the governor.

c. Discuss the effect of applying the brake to the vehicle when the brakes are applied to rear wheel only and front wheel only.

d. Four masses A, B, C and D are attached to a shaft and revolve in the same plane. The masses are 12 kg, 10 kg, 18 kg and 15 kg respectively and their radii of rotations are 40 mm, 50 mm, 60 mm and 30 mm. The angular position of the masses B, C and D are 60º, 135º and 270º from mass A. Find the magnitude and position of the balancing mass at a radius of 100 mm. Analytically and graphically both.

e. Derive an expression for the natural frequency of free longitudinal vibration by equilibrium method.

SECTION C

3. Attempt any *one* part of the following: 10x1=10

a. The crank and connecting rod of a vertical petrol engine, running at 1800 rpm are 60 mm and 270 mm respectively. The diameter of the piston is 100 mm and the mass of the reciprocating partsis 1.2 kg. During the expansion stroke when the crank has turned 20° from the top dead centre, the gas pressure is 650 kN/m^2. Determine the (i) net force on the piston (ii) net load on the gudgeon pin (iii) thrust on the cylinder walls (iv) speed at which the gudgeon pin load is reversed in direction.

b. Find the relation for the coefficient of fluctuation of speed in terms of maximum fluctuation of energy and the kinetic energy of the flywheel at mean speed.

4. Attempt any *one* part of the following: 10x1=10

a. What is gyroscopic effect? Discuss the gyroscopic effect on an aeroplane with neat diagram.

b. A vibrating system consists of a mass of 50 kg, a spring with a stiffness of 30 kN/m and a damper. The damping provided is only 20% of the critical value. Determine the

(i) damping factor
(ii) critical damping coefficient
(iii) natural frequency of damped vibrations
(iv) logarithmic decrement
(v) ratio of two consecutive amplitudes

5. Attempt any *one* part of the following: 10x1=10

a. Derive the fallowing expression for an uncoupled two cylinder locomotive engine
(i) Variation in tractive force
(ii) Swaying couple

b. Four masses A, B, C and D are completely balanced. Masses C and D make angles of 90° and 195° respectively with that of mass B in the counter-clockwise direction. The rotating masses have the following properties: m_b = 25 kg ,r_a = 150 mm; m_c = 40 kg, r_b = 200 mm; m_d = 35 kg , r_c = 100 mm; r_d = 180 mm. Planes B and C are 250 mm apart. Determine the (i) mass A and its angular position with that of mass B (ii) positions of all the planes relative to plane of mass A.

6. Attempt any *one* part of the following: 10x1=10

a. The following particulars refers to a Proell governor with open arms:
Length of all arms = 200 mm; distance of pivot of arms from the axis of rotation = 40 mm; length of extension of lower arms to which all balls are attached= 100 mm; mass of each ball= 6 kg and mass of central load = 50 kg. If the radius of rotation of the ball is 180 mm when the arms are inclined at an angle of 40º to the axis of rotation, find the equilibrium speed for the above configuration.

b. In a spring loaded Hartnell type governor, the extreme radii of rotation ofthe balls are 80 mm and 120 mm. The ball arm and the sleeve arm of the bell crank lever are equal in length. The mass of each ball is 2 kg. If the speeds at the two extreme positions are 400 and 420 r.p.m., find: 1.the initial compression of the central spring, and 2.the spring constant.

7. Attempt any *one* part of the following: 10x1=10

a. The simple band brake as shown in figure1, is applied to a shaft carrying a flywheel of mass 400 kg. The radius of gyration of the flywheel is 450 mm and runs at 300 rpm in anticlockwise direction. If the coefficient of friction is 0.2 and the brake drum diameter is 240 mm. Given AO = 120 mm, OC = 300 mm, Find the torque applied due to a hand load of 100 N and the number of turns of the wheel before it is brought to rest.

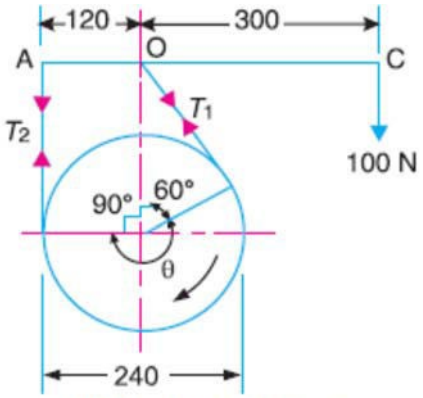

Figure 1

b. What is the advantage of a self- expanding shoe brake? Drive the relation for the friction torque for such a brake.