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

Paper ID : 140602 Roll No. | | | | | | | | | | |

B.TECH.

Theory Examination (Semester-VI) 2015-16

THEORY OF MACHINES-II

Time : 3 Hours *Max. Marks : 100*

Section-A

Q.1. Attempt All parts. (10×2=20)

(a) Explain the terms: (i) Coefficient of fluctuation of Energy (ii) Coefficient of fluctuation of speed

(b) What is the importance of a flywheel?

(c) Write the conditions of static and dynamic balancing.

(d) What do you mean by tractive effort and swaying couple?

(e) What is difference between watt governor and porter governor ?

(f) Explain effort and poer of a governor.

(g) What do you mean by gyroscopic couple?

(h) Explain primary and secondary balancing.

(i) What do you understand by processional motion?

(j) What do you mean by free and forced vibrations.

Section-B

Q.2. Attempt any FIVE parts. (5×10=50)

(a) Explain the turning moment diagram of 4 stroke engine.

(b) During a trial on steam engine, it is found that the acceleration of the piston is 36 m/s^2 when the crank has moved 30° from the inner dead centre position. The net effective steam pressure on the piston is 0.5 N/mm^2 and the frictional resistance is equivalent to a force of 600 N. The diameter of the piston is 300 mm and the mass of the reciprocating parts is 180 kg. If the length of the crank is 300 mm and the ratio of the connecting rod length to the crank length is 4.5, find: (1). Reaction on the guide bars (2). Thrust on the crank shaft bearings (3). Turning moment on the crank shaft.

(c) Explain the procedure balancing of several masses rotating in different planes.

(d) An inside cylinder locomotive has its cylinder centre lines 0.7 m apart and has a stroke of 0.6 m. The rotating masses per cylinder are equivalent to 150 kg at the crank pin, and the reciprocating masses per cylinder to 180 kg. The wheel centre lines are 1.5 m apart. The cranks are at right angles. The whole of the rotating and 2/3 of the reciprocating masses are to be balanced by masses placed at a radius of 0.6 m. Find the magnitude and direction of the balancing masses. Find the fluctuation in rail pressure under one wheel, variation of tractive effort and the magnitude of swaying couple at a crank speed of 300 r.p.m.

(e) Derive an expression for the equilibrium speed of proell Governor.

(f) The arms of a Porter governor are 300 mm long. The upper arms are pivoted on the axis of rotation. The lower arms are attached to a sleeve at a distance of 40 m, from the axis of rotation. The mass of the load on the sleeve is 70 kg and the mass of each ball is l0 kg. Determine the equilibrium speed when the radius of rotation of the balls is 200 mm. If the friction is equivalent to a load of 20 N at the sleeve, what will be the range of speed for this position ?

(g) Explain the application of gyroscopic principles to an aero plane.

(h) Derive an expression for the natural frequency of free transverse and longitudinal vibrations by equilibrium method.

Section-C

Attempt any TWO parts (2×15=30)

Q.3. (a) Derive an expression for safe peripheral speed of a flywheel.

(b) The turning moment diagram for a petrol engine is drawn to the following scales : Turning moment, I mm:5 N-m; crank angle, 1 mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are 295, 685, 40, 340,960,270 mm^2. The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coeffi-

cient of fluctuation of speed when ihe engine runs at 1800 r.p.m.

Q.4. (a) Describe the partial balancing of locomotives.

(b) A shaft carries four masses in parallel planes A, B, C and D in this order along its length. The masses at B and C are l8 kg and 12.5 kg respectively, and each has an eccentricity of 60 mm. The masses at A and D have an eccentricity of 80 mm. The angle between the masses at B and C is 100° and that between the masses at B and A is 190°, both being measured in the same direction. The axial distance between the planes A and B is 100 mm and that between B and C is 200 mm. If the shaft is in complete dynamic balance, determine : (i) The magnitude of the masses at A and D ; (ii) the distance between planes A and D ; (iii) the angular position of the mass at D.

Q.5. (a) Define and explain the following terms relating to governors :

(1) Stability (2) Sensitiveness (3) Isochronisms and (4) Hunting.

(b) The mass of a single degree damped vibrating system is 7.5 kg and makes 24 free oscillations in 14 seconds when disturbed from its equilibrium position. The amplitude of vibration reduces to 0.25 of its initial value after five oscillations. Determine : (l) stiffness of the spring, (2) logarithmic decrement (3) damping factor, i.e. the ratio of the system damping to critical damping.