BT-4/M09 9344

Dynamics of Machine

Paper : ME-210 E

Time : Three Hours] [Maximum Marks : 100

Note :– Attempt **FIVE** questions, at least **ONE** from each unit.

UNIT–I

1. (a) Explain importance of free body diagram in case of static force analysis. 5

   (b) The following data relate to the connecting rod of a reciprocating engine.

   mass– 50 kg, Distance between bearing centres– 900 mm, Dia. of big end bearing = 80 mm, Time of oscillation when the connecting rod is suspended from the big end = 1.7 sec, small end = 1.85 sec.

   Determine :- (i) the radius of gyration (k) of the rod about an axis through centre of mass perpendicular to the plane of oscillation, (ii) the moment of Inertia of the rod about the same axis, (iii) the dynamically equivalent system of connecting rod comprising two masses one at the small end bearing centre. 15

2. Turning moment diagram for a petrol engine is drawn to the following scale TM 1mm = 5 N-m, Crank angle 1mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean TM 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 coefficient of fluctuation of speed when the engine runs at 1800 rpm. 20

UNIT–II

3. (a) Define interference and pressure angle in involute profile gears. Show how interference is affected by pressure angle ? 10

   (b) Draw and explain differential of automobile. 5

   (c) Give condition for correct gearing and explain. 5

4. An epicyclic gear train is composed of a fixed annular gear A having 150 teeth. The gear A is meshing with gear B which drives gear B and C are carried on an arm which revolves CW at 100 rpm about the axis of A. If the gear B and D have 25 teeth and 40 teeth respectively find number of teeth on C and speed and sence of rotation of C. 20

UNIT–III

5. (a) What are the self locking and self energizing brakes ? Derive an expression for ratio of tight side and slack side tensions in band and block brake. 10

   (b) What are dynamometers ? Explain any one absorption dynamometer. 10

6. (a) The arms of porter governor are 250 mm long. The upper arms are pivoted on the axis of revolution but the lower arms are attached to a sleeve at a distance of 50 mm from the axis of rotation. The weight on sleeve is 600 N and the weight of each ball is 80 N. Determine the equillibrium speed when the radius of rotation of the balls is 150 mm. If the friction is equivalent to a load of 25 N of sleeve determine the range of speed for this position. 15

   (b) Explain balancing of multi cylinder engine, V engine. 5

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UNIT–IV

7. (a) Derive an expression for the gyroscopic stability of two wheel vehicle when taking a turn. 8

   (b) Explain the terms precessional motion, gyroscopic couple and gyroscopic effect in case of Naval ship. 8

   (c) Discuss application of Gyroscope in aeroplane. 4

8. (a) Prove that introduction of feed back device in an open loop control system reduces the transfer function and introduces the possibility of instability. Also discuss the merits of introducing the feed back system. 10

   (b) Explain open loop and closed loop systems with diagram and numerical method to solve the problems taking practical example of any mechanical system. 10

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