

BT-4/M-19
DYNAMICS OF MACHINE
Paper-ME-210N

Time allowed : 3 hours] [Maximum marks : 75
Note : Attempt five questions in all, selecting at least one question from each unit. All questions carry equal marks.

Unit-I

- (a) State the concept of an equivalent offset inertia force. 5
(b) The crank and connecting rod of a petrol engine, running at 1800 r.p.m. are 50 mm and 200 mm respectively. The diameter of the piston is 80 mm and the mass of the reciprocating parts is 1 kg. At a point during the power stroke, the pressure on the piston is 0.7 N/mm^2 , when it has moved 10 mm from the inner dead centre. Determine : 1. Net load on the gudgeon pin, 2. Thrust in the connecting rod, 3. Reaction between the piston and cylinder, and 4. The engine speed at which the above values become zero. 10
2. Draw the turning moment diagram of a single cylinder double acting steam engine. Explain precisely the uses of turning moment diagram of reciprocating engine. 15

Unit-II

3. Two mating involute spur gear of 20° pressure angle have a gear ratio of 2. The number of teeth on the pinion is 20 and its speed is 250 r.p.m. The module pitch of the teeth is 12 mm. If the addendum on each wheel is such that the path of approach and the path of recess on each side are half the maximum possible length. Find : 1, the addendum for pinion and gear wheel; 2. the length of the arc of contact; and 3. the maximum velocity of sliding during approach and recess. 15
4. Fig. 1 given below shows an epicyclic gear train. A has 40 teeth external (fixed gear); B has 80 teeth internal; C-D is a compound wheel having 20 and 50 teeth (external) respectively, E-F is a compound wheel having 20 and 40 teeth (external) respectively, and G has 90 teeth (external). The arm runs at 100 r.p.m. in clockwise direction. Determine the speeds for gears C, E, and B. 15

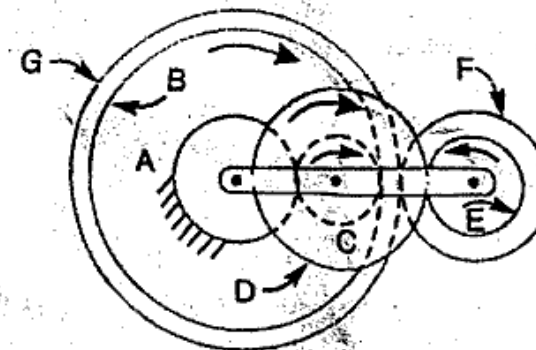


Fig. 1

Unit-III

5. In a band and block brake, the band is lined with 14 blocks, each of which subtends an angle of 20° at the drum centre. One end of the band is attached to the fulcrum of the brake lever and the other to a pin 150 mm from the fulcrum. Find the force required at the end of the lever 1 metre long from the fulcrum to give a torque of 4 kN-m. The diameter of the brake drum is 1 metre and the coefficient of friction between the blocks and the drum is 0.25. 15

6. In an engine governor of the Porter type, the upper and lower arms are 200 mm and 250 mm respectively and pivoted on the axis of rotation. The mass of the central load is 15 kg, the mass of each ball is 2 kg and friction of the sleeve together with the resistance of the operating gear is equal to a load of 25 N at the sleeve. If the limiting inclinations of the upper arms to the vertical are 30° and 40° , find, taking friction into account, range of speed of the governor. 15

Unit-IV

7. A rotating shaft carries four unbalanced masses 18 kg, 14 kg, 16 kg, and 12 kg at radii 50 mm, 60 mm, 70 mm and 60 mm respectively. The 2nd, 3rd and 4th masses revolve in planes 80 mm, 160 mm and 280 mm respectively measured from the

plane of the first mass and are angularly located at 60° , 135° and 270° respectively measured clockwise from the first mass looking from this mass end of the shaft. The shaft is dynamically balanced by two masses, both located at 50 mm radii and revolving in planes mid-way between those of 1st and 2nd masses and midway between those of 3rd and 4th masses. Determine, graphically or otherwise, the magnitudes of the masses and their respective angular positions. 15

8. Explain the effect of precession on a disc fixed at a certain angle to a rotating shaft. 15

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