



- 4 For a symmetrical tangent cam operating a roller follower, the least radius of cam is 30 mm and roller radius is 15 mm. the angle of ascent is  $60^\circ$ , the total lift is 15 mm and the speed of the cam shaft is 300 rpm. Calculate:
- Principal dimensions of cam (i.e. the distance between the cam centre and nose centre, nose radius and angle of contact of cam with straight flank)
  - Acceleration of the follower at the beginning of the lift, where the roller just touches the nose (i.e, flank merges into the nose) and at the apex of the circular nose. Assume that there is no dwell between ascent and descent. (20 Marks)

**PART – B**

- 5 a. Explain static and dynamic balancing. (04 Marks)
- b. A rotating shaft carries four masses 1, 2, 3 and 4 which are radially attached to it. The mass centres are 30 mm, 38 mm, 40 mm and 35 mm respectively from the axis of rotation. The masses 1, 3 and 4 are 7.5, 5 and 4 kg respectively. The axial distance between the planes 1 and 2 is 400 mm and, 2 and 3 is 500 mm. The masses 1 and 3 are at right angles to each other. Find for complete balance
- Angle between 1, 2 and 1, 4
  - Axial distance between 3 and 4
  - Magnitude of mass 2 (16 Marks)
- 6 a. Explain the partial primary balancing. (05 Marks)
- b. The firing order in a 6 cylinder vertical 4 stroke in line engine is 1-4-2-6-3-5, the piston stroke is 100 mm. Length of each C.R = 200 mm. The pitch distance between cylinder centerlines are 100 mm, 100 mm, 150 mm, 100 mm and 100 mm. Determine the out of balance primary and secondary forces and couples on this engine taking a plane midway between cylinders 3 and 4 as reference plane. The reciprocating mass per cylinder is 2 kg and the engine runs at 1500 rpm. (15 Marks)
- 7 a. Define the following:
- Sensitiveness
  - Hunting
  - Isochronous governor
  - Controlling force (08 Marks)
- b. A porter governor has arms 250 mm long, each are pivoted on the axis of rotation. Mass of each governor ball is 2 kg. At the mean speed of 200 rpm, it is found that centrifugal force exerted at each ball is 100 N. Neglecting friction, determine the central load if the sleeve movement is restricted to  $\pm 20$  mm. Also determine the range of speed. (12 Marks)
- 8 a. Explain the gyroscopic effect on ship. (10 Marks)
- b. An aeroplane make a complete half circle of 40 m radius towards left when flying at 175 km/hr. The mass of the rotary engine and propeller is 400 kg with radius of gyration 300 mm. The engine runs at 2500 rpm clockwise when viewed from the rear. Find the gyroscopic couple on the aircraft. What will be the effect if the aeroplane turn towards right instead of left? (10 Marks)

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