



TIME- 3Hrs

Total Marks-80

- N.B. :**
1. Question No 1 is compulsory
 2. Attempt any **Three** questions from the remaining five questions.
 3. Assume any **suitable data** if necessary with justification.
 4. Figures to the right indicates full marks

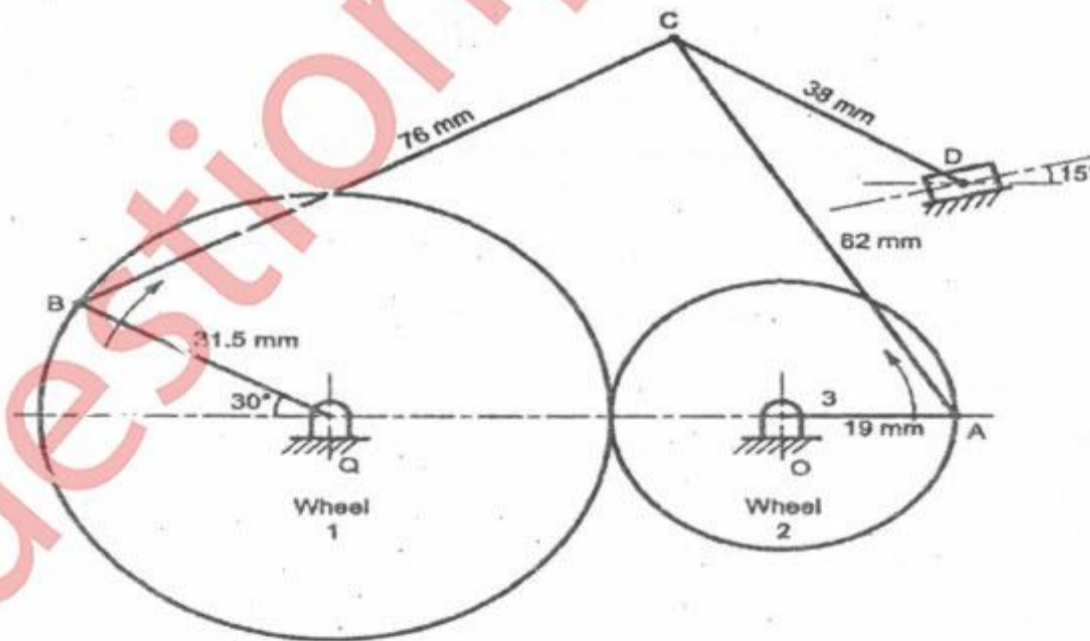
Q.1 Attempt any **four** of the following questions.

20

- a) Explain different kinds of kinematic pairs giving example for each one of them.
- b) Describe the construction and operation of a rope brake dynamometer.
- c) Explain the "Law of gearing."
- d) What do you mean by Corolli's component? Prove that this component of acceleration is equal to $2v\omega$.
- e) Explain reverted gear train with its applications.

Q.2 a) Fig. shows Andreau variable stroke mechanism in which wheel 1 and wheel 2 have a rolling contact without slipping. For a given dimensions and positions of cranks OA and QB, find out the velocity and acceleration of the slider at D and also angular velocity and angular acceleration of each link, if crank rotates at uniform speed of 1800 rpm.

15



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b) Sketch a pantograph, explain its working and show that it can be used to reproduce an enlarged scale of a given figure. 05

Q. 3 a) A band and block brake, having 14 blocks each of which subtends an angle of 14° at the centre, is applied to a rotating drum with a diameter of 750 mm. The blocks are 65 mm thick. The two ends of the band are attached to pins on the lever at a distance of 50 mm and 210 mm from the fulcrum on the opposite sides. Determine the least force required to be applied at the lever at a distance of 600 mm from the fulcrum, if the power absorbed by the blocks is 180 kW at 175 r.p.m. The coefficient of friction between blocks and drum may be taken as 0.35. 10

b) Explain the term whirling speed of shaft. Prove that the whirling speed for a rotating shaft is the same as the frequency of natural transverse vibration. 10

Q.4a) A single plate clutch is required to transmit 25 kW at 900 rpm. The maximum pressure intensity between the plates is 85 KN/m^2 . The outer diameter of the plate is 360 mm. Both the sides of the plate are effective and the coefficient of friction is 0.25. Determine the
i) Inner diameter of the plate and ii) the axial force to engage the clutch. 10

b) Two 20° involute spur gears mesh externally and give a velocity ratio of 3. The module is 3 mm and the addendum is equal to 1.1 module. If the pinion rotates at 120 rpm, determine the (i) minimum number of teeth on each wheel to avoid interference. (ii) contact ratio. 10

Q.5 a) The following data relate to a cam profile in which the follower moves with uniform acceleration and deceleration during ascent and descent: 15

Minimum radius of cam = 25 mm

Diameter of roller = 7.5 mm

Lift = 28 mm

Offset of follower axis = 12 mm towards right

Angle of ascent = 60°

Angle of descent = 90°

[TURN OVER

Angle of dwell between ascent and descent = 45°

Speed of cam = 200 rpm

Draw the profile of the cam.

b) Derive an expression for minimum number of teeth on a pinion to avoid interference. 05

Q.6 a) A, B, C and D are four masses carried by a rotating shaft at radii 110 mm, 140 mm, 210 mm, and 160 mm respectively. The planes in which the masses rotate are spaced at 700 mm apart and the magnitude of the masses B, C & D are 12 kg, 7 kg and 5 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance. 12

b) Sketch and explain different inversions of a double slider crank mechanism with one application each. 08
