

Time: 3 Hrs

Marks : 80

- 1) Question No. 1 is **compulsory**.
- 2) Attempt any **three** questions out of remaining **five** questions
- 3) Assume suitable data wherever necessary but justify the same
- 4) Figures to the right indicate Marks

1. Answer any **four** of the following questions

20

- i) Classify and explain different types of instantaneous centres?
- ii) With neat sketch explain Undercutting in CAMS
- iii) Explain slip and creep in belt drives.
- iv) Classify Kinematic pairs with suitable example?
- v) State and explain work energy principle

2. (A) The mechanism, as shown in Fig. 1 the slider D is constrained to move on a

horizontal path. The crank OA is rotating in the counter clockwise direction at a speed of 180 r.p.m. The dimensions of various links are as follows: OA = 180 mm; CB = 240 mm; AB = 360 mm; and BD = 540 mm. For the given configuration, find:

Velocity of slider D,

1. By instantaneous center method
2. By relative velocity method

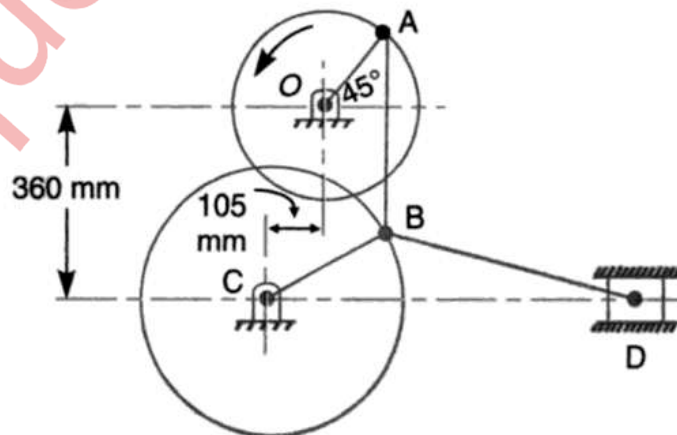


Fig. 1

- (B) Draw a neat sketch of Harts mechanism and prove that it traces a exact straight line. **08**
3. (A) Fig 2 shows the mechanism of a radial valve gear. The crank OA turns uniformly at 150 rpm and is pinned at A to rod AB. The point C in the rod is guided in the circular path with D as center and DC as radius. The dimensions of various links are OA = 150 mm; AB = 550 mm; AC = 450 mm; DC = 500 mm; BE = 350 mm. Determine velocity and acceleration of the ram F for the given position of the mechanism. **14**

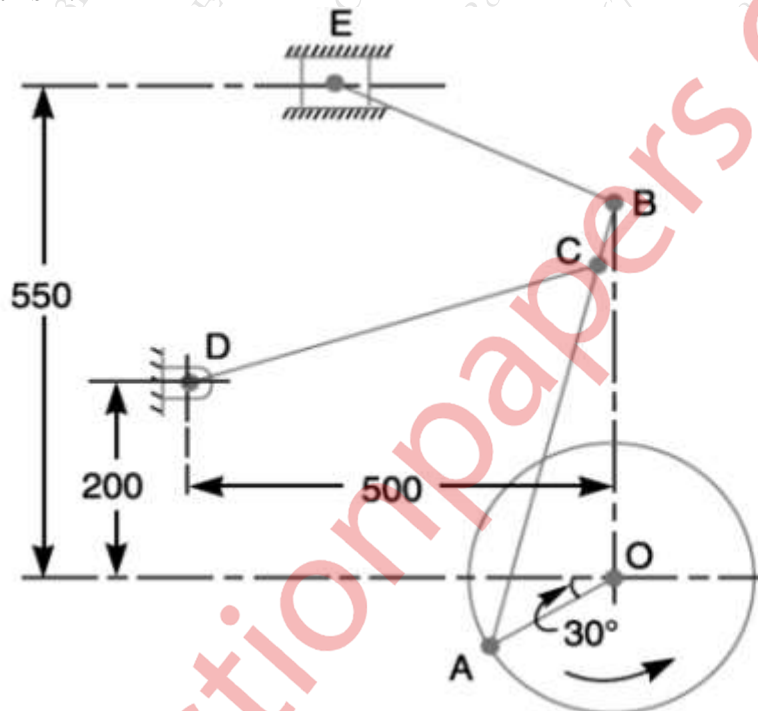


Fig. 2

- (B) Determine the maximum permissible angle between the shaft axes of a universal joint if the driving shaft rotates at 800 rpm and the total fluctuation of the speed does not exceeds 60 rpm. Also compute maximum and minimum speeds of driven shafts. **06**
4. (A) In an open belt drive, the diameters of the larger and smaller pulley are 1.2 m and 0.8 m respectively. The smaller pulley rotates at 320 rpm. The center distance between the shafts is 4 m. When stationary, the initial tension on the belt is 2.8 kN. The mass of belt is 1.8 kg/m and the coefficient of friction between the belt and pulley is 0.25. Determine the power transmitted. **10**
- (B) A cord wrapped around a solid cylinder of radius 'r' and mass 'm'. The cylinder is released from rest. Determine the velocity of its centre of mass after it has moved down a distance 'h'. **10**

5. (A) Fig 3 shows a reverted epicyclic gear train, the arm A carries two gears B and C and a compound gear D – E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed, and the arm A makes 100 r.p.m. clockwise **10**

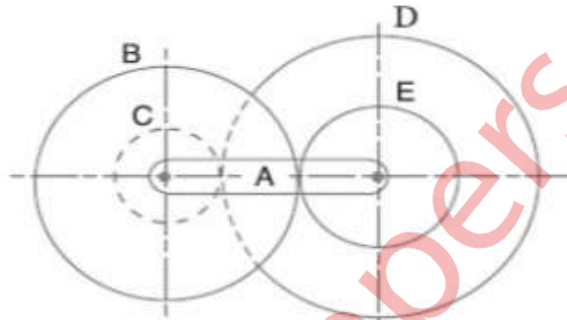


Fig. 3

- (B) Illustrate with neat sketch band brake and state its applications. **05**
- (C) Explain the concept of centrifugal tension and state its effect on power transmission ? **05**
6. (A) The number of teeth on each of the two equal spur gears in mesh is 50. The teeth have  $20^\circ$  involute profile and the module is 6 mm. If the arc of contact is 1.65 times the circular pitch. Find the addendum. **08**
- (B) A cam is rotating at 200 rpm operate a reciprocating roller follower of radius 2.5 cm. The least radius of cam is 30 mm, stroke of follower is 5 cm. Ascent takes place by uniform acceleration and deceleration and descent by simple harmonic motion. Ascent takes place by  $70^\circ$  and descent during  $50^\circ$  of cam rotation. Dwell between ascent and descent  $60^\circ$ . Sketch displacement, velocity, acceleration, diagram. Indicate the maximum values of velocity and acceleration and state the nature of curves. **12**

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