

**Total Marks 80**

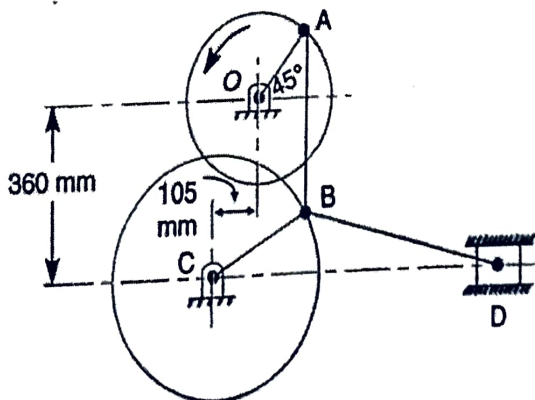
N.B:

- 1) Attempt any **three** questions out of remaining **five** questions
- 2) Assume suitable data wherever necessary but justify the same
- 3) Figures to the right indicate Marks

20

- i) What are the different types of instantaneous centres?
- ii) Classify cam in detail
- iii) Explain Self energizing and Self-locking brake
- iv) What are the different types of constrained motion?
- v) State and explain work energy principle and conservation of energy

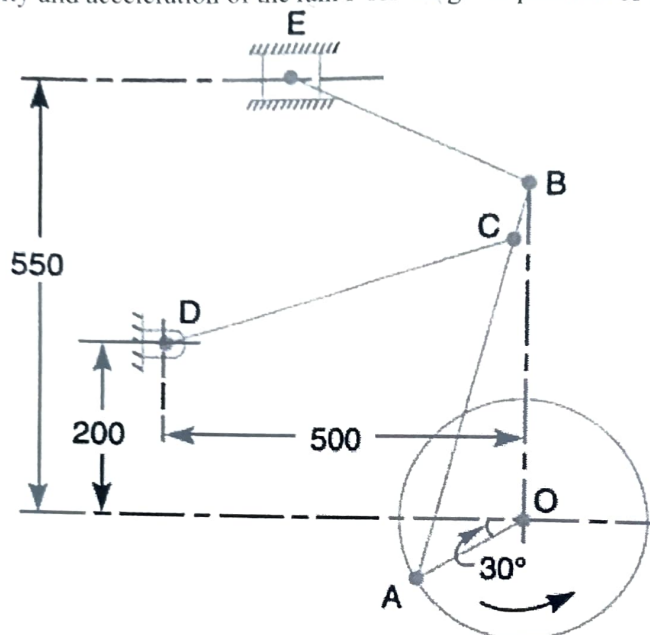
2. (A) The mechanism, as shown in Fig. 1 the slider D is constrained to move on a horizontal path. The crank OA is rotating in the counter clockwise direction at a speed of 180 r.p.m. The dimensions of various links are as follows: OA = 180 mm; CB = 240 mm; AB = 360 mm; and BD = 540 mm. For the given configuration, find:
1. Velocity of slider D,
  2. Angular velocity of links AB, CB, and BD
1. By instantaneous center method
  2. By relative velocity method



**Fig. 1**

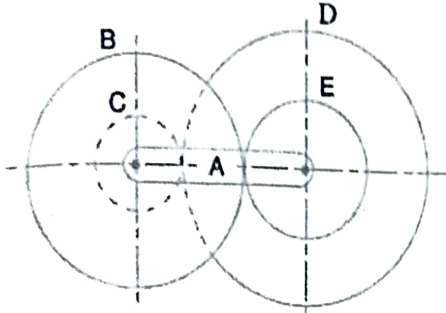
- (B) Draw a neat sketch of Tchebicheff mechanism and prove that the length of links must be in a ratio of 1:2:2.5 08

3. (A) Figure 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



- (B) What is the effect of centrifugal tension on power transmitted in belt drive? 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) In 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



- (B) Compare involute and cycloidal gear teeth profiles 05
- (C) What is chordal action in chain? 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. 10
- (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, and jerk diagram. 10