19/05/2025 SE MECHANICAL SEM-IV C-SCHEME KOM QP CODE: 10085468

**Duration: 3hrs** **[Max Marks:80]**

N.B.: (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume any suitable data, wherever required, but justify the same. Assumptions made should be clearly stated.
(5) Illustrate the answers with sketches, wherever required.

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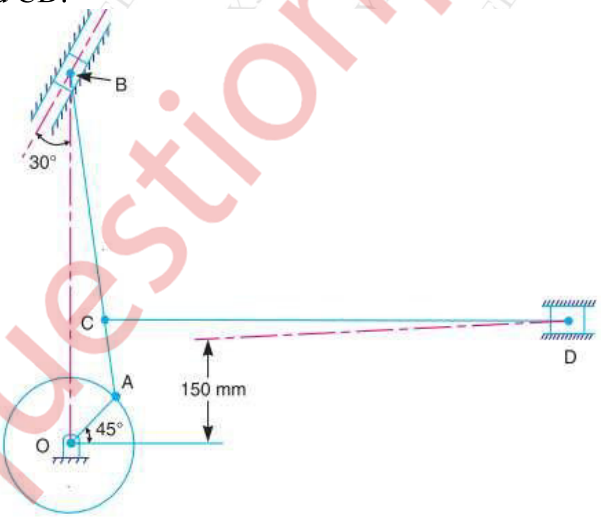
| 1 | | Attempt any FOUR | [20] |
| | A | Classify Kinematic pairs with suitable example | [05] |
| | B | Illustrate with neat sketch band brake and state its applications. | [05] |
| | C | Classify gears with neat sketch and explain the law of gearing. | [05] |
| | D | Differentiate between Involute and cycloidal gear tooth profile. | [05] |
| | E | How Peaucellier's mechanism converts rotary motion into straight-line motion, explain in brief supported with a diagram. | [05] |
| 2 | A | The crank OA of a mechanism, as shown in Fig., rotates clockwise at 120 r.p.m. The lengths of various links are : OA = 100 mm ; AB = 500 mm ; AC = 100 mm and CD = 750 mm. Find, Velocity of point C ; Velocity of slider D ; and Angular velocities of the links AB and CD. | [12] |

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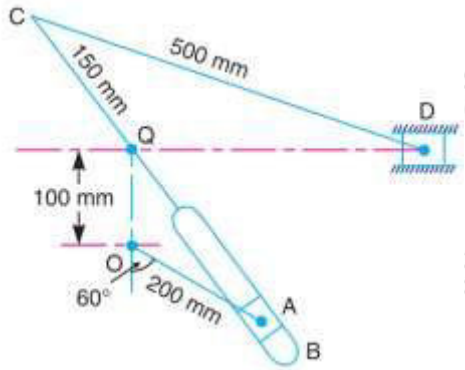
| | B | Explain the concept of centrifugal tension in case of belt drive and derive its equation and also state its effect on power transmission. | [8] |
| 3 | A | List the inversions of the single slider mechanism and explain the working of the oscillating cylinder engine mechanism. | [8] |

B A quick return motion mechanism in which the driving crank OA rotates at 120 r.p.m. in a clockwise direction. For the position shown in figure , determine the magnitude and direction of the acceleration of the block D ; and the angular acceleration of the slotted bar QB. [10]



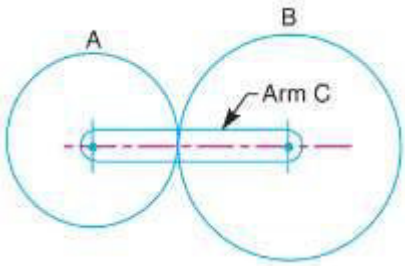

4 A A shaft rotating at 200 r.p.m. drives another shaft at 300 r.p.m. and transmits 6 kW through a belt. The belt is 100 mm wide and 10 mm thick. The distance between the shafts is 4m. The smaller pulley is 0.5 m in diameter. Calculate the stress in the belt, if it is 1. an open belt drive, and 2. a cross belt drive. Take $\mu = 0.3$. [10]

B A pair of 20° full depth involute spur gears having 30 and 50 teeth respectively of module 4 mm are in mesh. The smaller gear rotates at 1000 r.p.m. Determine : 1. Sliding velocities at engagement and at disengagement of pair of a teeth, and 2. contact ratio. [10]

5 A 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 $70^0$ and descent during $50^0$ of cam rotation. Dwellbetween ascent and descent $60^0$. Sketch displacement, velocity, acceleration, diagram. Indicate the maximum values of velocity and acceleration and state the nature of curve. [12]

B Obtain an expression for the length of a chain. [8]

6 A In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m. in the anticlockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed, makes 300 r.p.m. in the clockwise direction, what will be the speed of gear B. [10]




B Classify cams and follower and explain cam terminology. [10]

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