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SE Sem-IV | Branch- Mechanical | NOV-2025 | Q.P Code - 00298

Duration 3 hours Date - 08-12-25 Maximum marks 80

N.B: 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 Kinematic pairs with suitable example
ii) Classify different types of brakes with suitable example
iii) State and explain Kenedy theorem to locate ICR
iv) Derive the condition for correct steering in automobile
v) State and explain work energy principle and D'Alembert's principle

2. **(A)** A mechanism, as shown in Fig 1. has the following dimensions: A = 200 mm; AB = 1.5 m; BC = 600 mm; CD = 500 mm and BE = 400 mm. Locate all the instantaneous centres. If crank OA rotates uniformly at 120 r.p.m. clockwise, find 1. the velocity of B, and D. Locate at least 10 ICR **12**

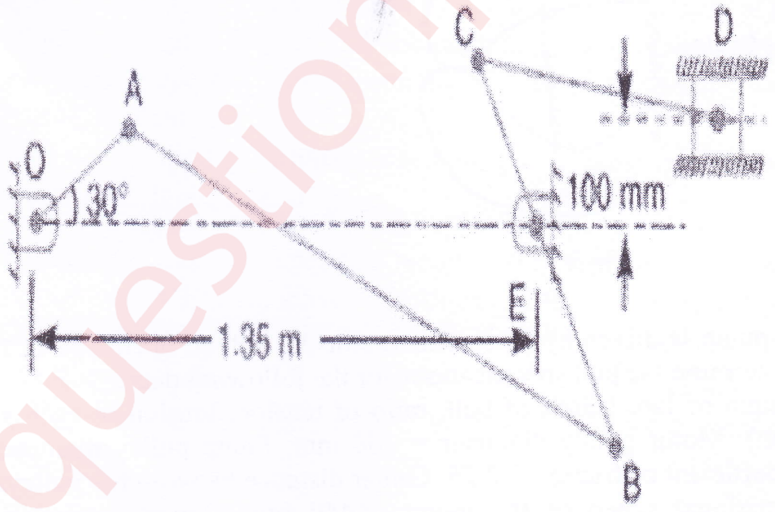

Fig.1

(B) Differentiate with neat sketch Harts Mechanism and Peculiar Mechanism based on links/pair and application. **08**

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3. (A) In the mechanism, as shown in Fig. 2 the crank OA rotates at 20 rpm anticlockwise and gives motion to the sliding blocks B and D. The dimensions of the various links are OA = 300 mm; AB = 1200 mm; BC = 450 mm and CD = 450 mm. For the given configuration, determine: 1. Velocities of sliding at B and D, 2. Angular velocity of CD, 3. linear acceleration of D. 14

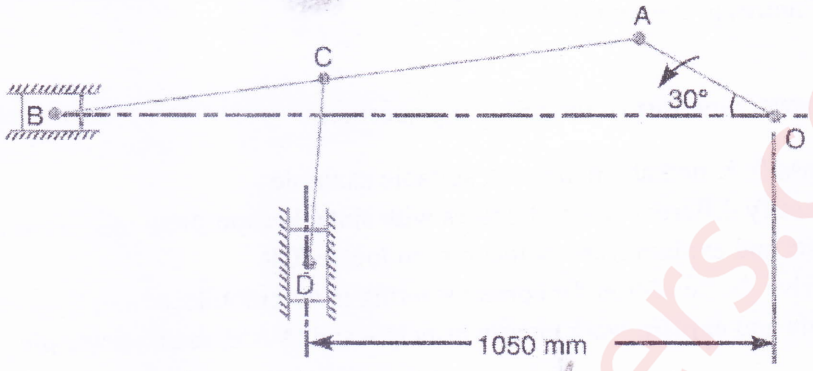

Fig 2

(B) What is Degree of Freedom (DOF) of plane mechanism with suitable example? Also compute degree of freedom for the mechanism shown. 06

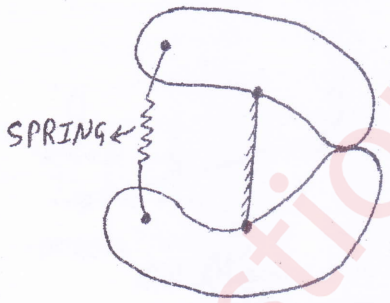

Fig 3

4. (A) A pump is driven by an electric motor through an open type of flat belt drive. Determine the belt specifications for the following data. (angle of lap, length of belt, ratio of tension, tension in each side, width of belt). Motor pulley diameter = 300 mm, Pump pulley diameter = 600 mm, Coefficient of friction = 0.25. Center distance between the pulleys = 1000 mm, Rotational speed of the motor =1440 rpm, Power transmission = 20kW; permissible tension = 10kN. 10

(B) A uniform bar of mass 'm' and length 'L' hangs from a frictionless hinge. It is released from the horizontal position. Find the angular velocity of the centre of mass 'G' when it is vertical position. 10

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5. (A) An epicyclic gear consists of three gears A, B and C as shown in Fig. 4 The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 rpm. If the gear A is fixed, determine the speed of gears B and C. **10**

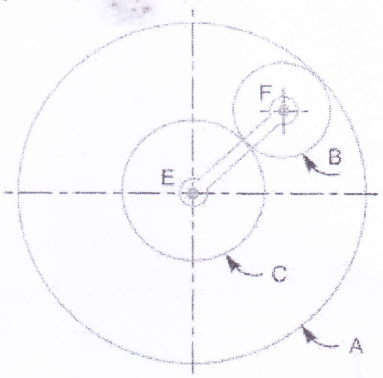

Fig 4

(B) Classify Cams and follower with suitable example. Also explain any Five Cam Terminology. **10**

6. (A) Two involute gears of 20° pressure angle are in mesh. The number of teeth on pinion is 20 and the gear ratio is 2. If the pitch expressed in module is 5 mm and the pitch line speed is 1.2 m/s, assuming addendum as standard and equal to one module, Determine **10**
1. The angle turned through by pinion when one pair of teeth is in mesh
2. The maximum velocity of sliding

(B) A cam is rotating at 300 rpm operate a reciprocating knife edge follower. The least radius of cam is 30 mm, stroke of follower is 40 mm. Ascent takes place by uniform acceleration and deceleration and descent by simple harmonic motion. Ascent take place by 120° and descent during 90° of cam rotation. Dwell between ascent and descent 30°. Sketch displacement, velocity, and acceleration **10**
