

Max marks 80

Duration: 3Hours

N.B:

Question No. 1 is **compulsory**.

Attempt any **three** questions out of remaining **five** questions

Assume suitable data wherever necessary but justify the same
Figures to the right indicate Marks

Q 1 Solve any four

[20]

1. State and Explain D'Alembert's Principle
2. Explain Hooke's joint with neat sketch
3. Differentiate between involutes and cycloidal gear tooth profile
4. Classify various types of chains
5. Sketch, explain reverted gear train with suitable example
6. Types of ICR

Q 2 A) In the mechanism, as shown in Fig 1, the crank OA rotates at 20 r.p.m. 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. Compute acceleration of slider B and D.

[14]

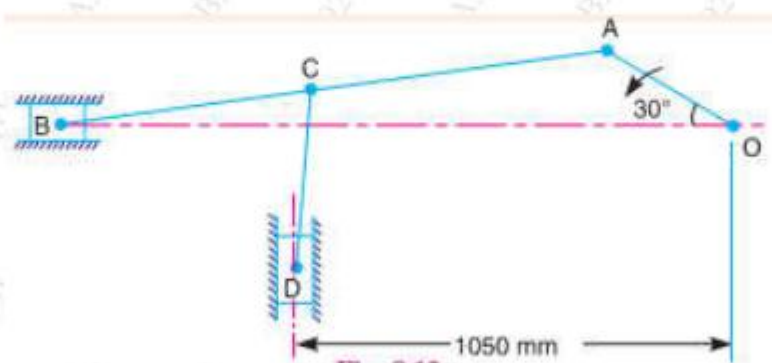


Fig 1

Q 2 B) Explain with neat sketch Coriolis component of acceleration.

[6]

Q 3 A) A flat belt drives a pulley, the angle of the lap being 120° . The belt is 100 mm wide and 6 mm thick. The density of belt material is 1000 kg/m^3 . If the coefficient of friction is 0.3 and the maximum stress in the belt should not exceed 2 MPa, find the maximum power that the belt can transmit and the corresponding speed of the belt.

[10]

Q 3 B) A sphere of radius 0.1m starts rolling without slip up on an inclined plane. The angle of plane is 30° with the horizontal. If the initial angular velocity of the sphere is 5 rad/sec, determine how far the sphere will travel before it reverse its motion. [10]

Q 4 A) Derive the equation for correct steering in Davis steering mechanism. [10]

Q 4 B) Derive the equation for ratio of tension for flat belt drive. [10]

Q 5 A) Classify gear and gear trains with neat sketch. Also state law of gearing. [10]

Q 5 B) Two gear wheels mesh externally and are to give a velocity ratio of 3 to 1. The teeth are of involute form; module = 5 mm, addendum = one module, pressure angle = 20° . The pinion rotates at 150 r.p.m. Determine: 1. The number of teeth on the pinion to avoid interference on it and the corresponding number of teeth on the wheel, 2. The length of path and arc of contact, 3. The number of pairs of teeth in contact, and 4. The maximum velocity of sliding.[10]

6. (A) Classify cams and follower and explain cam terminology [8]

(B) A cam is rotating at 300 rpm operate a reciprocating knife edge follower. The least radius of cam is 25 mm, stroke of follower is 35 mm. Ascent and descent by simple harmonic motion. Ascent takes place by 60° and descent during 45° of cam rotation. Dwell between ascent and descent 30° . Sketch displacement, velocity, and acceleration. State the nature of curves and show the maximum values of velocity and acceleration. [12]
