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25226

3 Hours / 70 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Assume suitable data, if necessary.
(5) Use of Non-programmable Electronic Pocket Calculator is permissible.
(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. **Attempt any FIVE of the following :** **10**
- a) List any four inversions of single slider crank mechanism.
 - b) Define higher pair with one example.
 - c) Define Kinematic link and Kinematic pair.
 - d) List any four types of follower.
 - e) Define :
 - i) Prime circle
 - ii) Cam profile
 - f) Define :
 - i) Module
 - ii) Pitch circle in gear
 - g) State the bad effects of improper balancing of rotating parts.

P.T.O.

2. Attempt any THREE of the following :

12

- a) Find number of degree of freedom for mechanism shown in Figure No. 1.

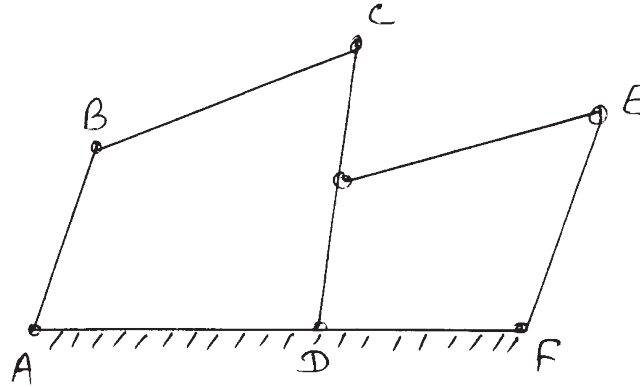


Fig. No. 1

- b) Compare belt drive and gear drive. (Any four points)
- c) State any four advantages of chain drive.
- d) Define terms –
- i) Vibration
 - ii) Time Period
 - iii) Cycle
 - iv) Frequency

3. Attempt any THREE of the following :

12

- a) Draw a neat labelled sketch of elliptical trammel. Explain in brief.
- b) Explain the construction of compound gear train with suitable sketch.
- c) Define :
- i) Free vibration
 - ii) Forced vibration
 - iii) Undamped vibration
 - iv) Damped vibration

- d) Suggest suitable gears for power transmission between
- A parallel shaft (at least two gears)
 - Intersecting shaft
 - Non-intersecting and non parallel shaft
- e) Three masses 10 Kg, 20 Kg and 15 kg are attached at a point at radii of 20 cm, 25 cm and 15 cm respectively. If the angle between successive masses is 50° and 90° determine the balancing mass to be attached at a radius of 30 cm.

4. Attempt any TWO of the following :

12

- Draw a neat sketch of crank and slotted lever quick return mechanism. Explain its construction and working.
- PQRS is a four bar chain with link PS fixed. Length of links are $PQ = 62.5$ mm, $QR = 175$ mm, $RS = 112.5$ mm, $PS = 200$ mm. The crank PQ rotates at 20 r/s clockwise. Draw space diagram when angle $QPS = 60^\circ$. Also draw velocity and acceleration diagram to find angular velocity and angular acceleration of link QR. (Refer Figure No. 2)

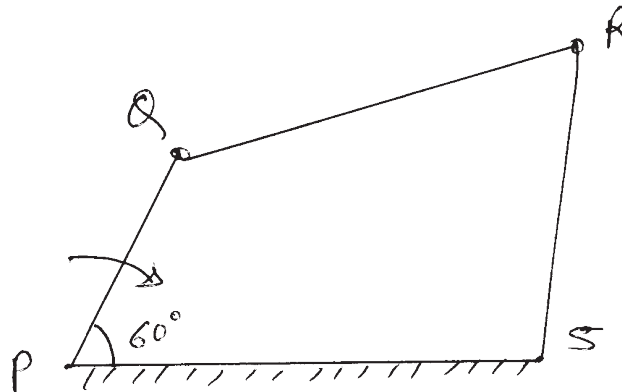


Fig. No. 2

- c) A cam is to be designed for knife edge follower with the following data :
- Cam lift = 40 mm during 90° rotation of cam with SHM
 - Dwell for next 30°
 - During the next 60° rotation of cam follower returns to its original position with SHM
 - Dwell during remaining 180°

Draw the profile of cam when line of stroke of follower passes through the axis of cam shaft. The radius of base circle is 40 mm.

5. Attempt any TWO of the following :

12

- Explain with neat sketch types of constrained motion.
- Find velocity and acceleration of piston P as shown in Figure No. 3.

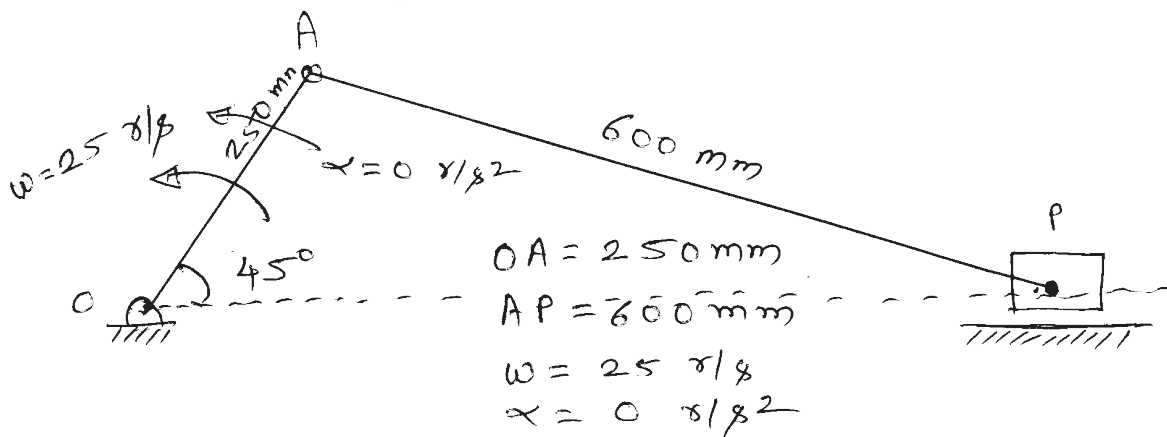


Fig. No. 3

- Classify followers with neat sketch.

6. Attempt any TWO of the following :**12**

- a) Explain procedure to determine velocity and acceleration of piston and connecting rod by Klien's construction with neat sketch.
 - b) Draw a profile of a cam operating roller reciprocating follower having lift of 50 mm. The roller diameter 20 mm. The minimum radius of cam is 30 mm. Cam rises the follower for 110° followed by dwell of 80° and return for next 120° . Follower rises and returns with uniform velocity.
 - c) An open belt drive 10 cm wide connects two pulleys mounted on parallel shafts 2.5 m apart. The diameter of driving pulley is 45 cm and that of follower is 30 cm. If permissible pull in the belt is limited to 200 N per cm. width of belt. Find power that can be transmitted when driving pulley is rotating at 120 rpm. Assume coefficient of friction $\mu = 0.35$ for belt and pulley surfaces.
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