313313

3 Hours / 70 Marks   Seat No.

Instructions –   (1) All Questions are *Compulsory*.

(2) Answer each next main Question on a new page.

(3) Assume suitable data, if necessary.

(4) Use of Non-programmable Electronic Pocket Calculator is permissible.

(5) 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) Define statics and dynamics.

b) List the different types of Kinematic pair.

c) Define :–

  i)   Linear velocity

  ii)   Angular velocity.

d) State the types of cams.

e) Write any two disadvantages of chain drive.

f) State any two advantages of vibration.

g) List the names of inversion of single slider crank. (Any two)

2.   **Attempt any THREE of the following:**   **12**

a) Draw a neat sketch of "Scotch Yoke Mechanism". Explain it's construction.

b) Explain slip and creep in belt drive.

   c) Explain Klein's construction method to identify velocity of links.

   d) Explain with neat sketch the working of "Coupling rod Locomotive".

3.   **Attempt any <u>THREE</u> of the following:**   **12**

   a) List the different types of followers and draw a neat sketch of followers (Any four points).

   b) Explain the construction of 'Epicyclic gear train' with Neat sketch.

   c) State advantages and disadvantages of vibrations.

   d) Following figures shows different chains. State the given chains are locked chain, constrained chain or un-constrained chain.

   (LHS = RHS) (LHS > RHS) (LHS < RSH)
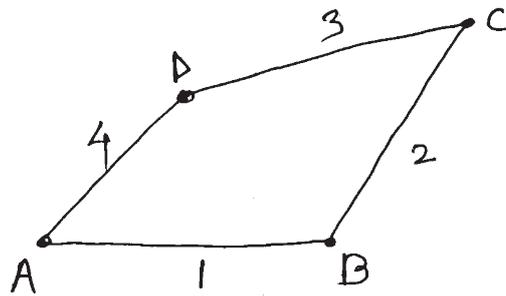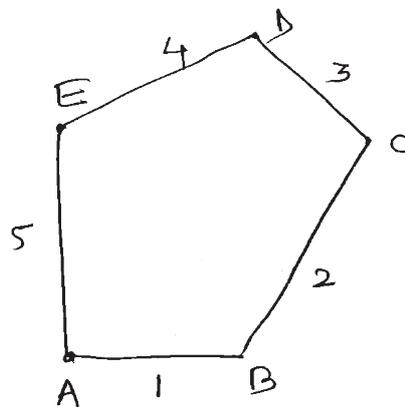
   [Refer Figure No. 1 and Figure No. 2]

Fig. No. 1

Fig. No. 2

4. Attempt any THREE of the following: 12

a) State the different 'Follower Motions'. Draw a sketch of any one follower motion. (Displacement diagrams)

b) Differentiate between belt drive and chain drive (Any four point).

c) Define the following terms related to Spur Gear :–

   i) Addendum

   ii) Deddendum

   iii) Module

   iv) Pressure angle.

d) Four masses m1, m2, m3 and m4 are 150 kg, 200 kg, 250 kg and 210 kg respectively. The corresponding radii of rotation are 15 cm, 10 cm, 20 cm and 25 cm. The angles are 10°, 60°, 130° and 245° respectively. If the radius of rotation of balance mass is 18 cm. Find the position and magnitude of balance mass Analytically

         OR

Graphically (Use any one method).

e) Define 'Free vibration' and 'Forced vibration'.

5. Attempt any TWO of the following: 12

a) Define relative velocity. State the inter-relation between linear and angular velocity and acceleration.

b) Explain with sketch "Elliptical trammel". State it's application (Any two points).

c) A cam is to give the following motion to a knife edge follower.

   i) Outstroke during 60° with SHM.

   ii) Dwell for next 30° of rotation.

   iii) Return stroke during next 60° of cam rotation with uniform velocity.

iv) Dwell for remaining cam rotation. The stroke of the follower is 40 mm and mini radius of cam 50 mm. Draw the cam profile, when axis of CAM passes through the axis of follower.

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

a) A Roller follower is preferred that of knife edge follower. Justify your answer and state any two applications of roller followers.

b) A four bar chain mechanism shown in Figure No. 3 is as follows :–

P_1A = 300 mm, P_2B = 360 mm, P_1P_2 = 600 mm

$\angle AP_1P_2$ = 60°. The crank P,A has an angular velocity (w) of 10 rad/sec. and angular acc^n (α) 30 rad/sec^2 clockwise. Determine the angular velocity of P_2B and AB.

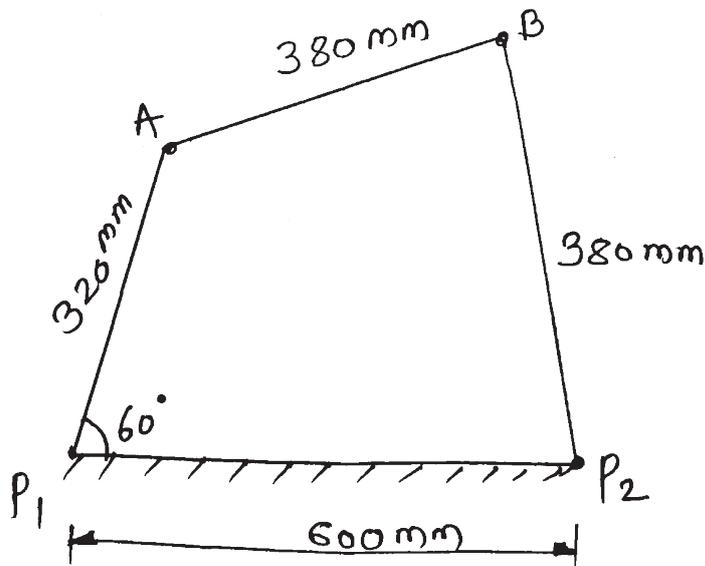380 mm

B

A

320 mm

380 mm

60°

P_1

P_2

600 mm

Fig. No. 3

c) A flat belt drive is required to transmit 35 kW from a pulley of 1.5 m effective diameter running at speed of 300 rpm. The angle of contact is 165° (θ = 165°) and coefficient of friction for the surface is 0.3. Determine the tensions in the belt. (Find T_1 and T_2).