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3 Hours / 70 Marks   Seat No.

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

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

(3) Illustrate your answer with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

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

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1.   **Attempt any <u>FIVE</u> of the following:**   **10**

a) Define:

   i)   Kinematic link

   ii)   K. Pair.

b) State any two names of inversion of double slider crank mechanism.

c) Define linear velocity and angular velocity.

d) List any four materials used for making flat Belt and V-Belt.

e) State the bad effects of improper balancing.

f) State any two advantages of vibration.

g) List the different types of kinematic pair.

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

  a) Draw a neat sketch of "Elliptical Trammel". Explain it's construction.

  b) Differentiate between flat Belt and V-Belt. (Any four points)

  c) State the relation between 'linear and angular' velocity. Explain the need of velocity diagram.

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

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

  a) Draw a neat sketch of different 'types of followers' with label (Name). (Any four types)

  b) Explain the construction of 'Compound gear train' with suitable sketch.

  c) State the various causes and remedies of machine vibration. (Any four causes)

  d) Following Figure shows three bar chain and four bar chain. (Figure No. 1 and Figure No. 2) State whether the given chains are locked chain, constrained chain or unconstrained chain (LHS > RHS, LHS = RSH, LHS < RHS).

Fig. No. 1   **Fig. No. 2**

Marks
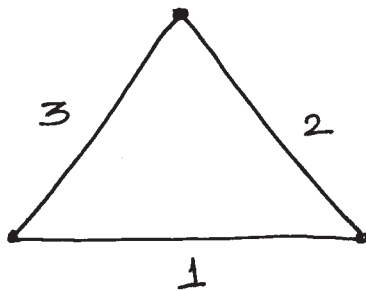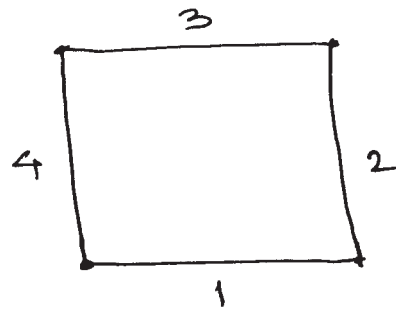
4. **Attempt any THREE of the following:** 12

a) Draw basic 'Cam follower' diagram showing its terminology (min. four terminology)

b) Explain the phenomena of 'Slip' in a belt drive.

c) Define the following terms related to Spur Gear.

 i) Addendum

 ii) Deddendum

 iii) Module

 iv) Pressure angle.

d) Four masses M_1, M_2, M_3, M_4 are 200 kg., 300 kg., 240 kg and 260 kg. respectively. The corresponding radii of rotation are 0.2 m, 0.15 m. 0.25 m. and 0.3 m. respectively and angles are 0°, 45°, 120° and 255° respectively. Find the position and magnitude of balance mass required. When it's radii of rotation is 0.2 m. Solve by Analytically or Graphically.

e) State the difference between free vibration and forced vibration. [OR – Define the terms 'Free vibration' and 'Forced vibration.']

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

a) Explain Klein's construction to determine velocity and acceleration in single crank mechanism.

b) Draw a neat sketch of 'Oldham's coupling' and explain its working.

c) Draw cam profile for knife edge follower when –

 i) Minimum radius of can = 5 cm.

 ii) Stroke of follower = 4 cm.

 iii) Outstroke 90° with uniform velocity.

 iv) Next 60° Dwell.

 v) Follower return during 90° of cam rotation with uniform velocity. The axis of knife edge follower is passes through axis of cam.

Marks

6. **Attempt any <u>TWO</u> of the following:** **12**

a) In a four bar chain ABCD, AD is fixed and 300 mm long. The crank AB is 80 mm long and rotates 120 rpm clockwise. Angle $\angle$ BAD = 45°. The link CD 180 mm long oscillate. BC = AD. Find the angular velocity of link CD.

b) A roller follower is preferred to that of knife edge follower. Justify your answer and state the application of roller follower (Any two applications).

c) In a flat belt drive initial tension (To) = 1800 N (To=1800 N) angle of lap on smaller pulley is 170°, co-efficient of friction is 0.25. The diameter of pulley is 90 cm. and runs at 540 rpm. Find the power transmitted by Belt.

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