



22438

12223

3 Hours / 70 Marks

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
  - (2) Answer each next main Question on a new page.
  - (3) Illustrate your answers 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 FIVE of the following :****5 × 2 = 10**

- (a) List the types of constrained motion with one example.
- (b) State two examples of Rigid link and flexible link.
- (c) Define (1) Linear Velocity and (2) Angular Velocity with mathematical expressions.
- (d) List any four types of follower.
- (e) State two important function of brakes.
- (f) State two methods of balancing of single rotating masses.

**2. Attempt any THREE of the following :****3 × 4 = 12**

- (a) Draw a neat sketch of Oldham coupling and label the following parts :  
(1) Shaft (2) Flanges (3) Bearing (4) Centre block



- (b) Differentiate between flat belt and 'V' belt on the basis of :  
(1) Velocity Ratio (2) Cost (3) Space (4) Application
- (c) Explain construction and working of Radial Cam with suitable sketch.
- (d) Explain construction and working of compound gear train with sketch showing power transmitting direction.

**3. Attempt any THREE of the following :**

**3 × 4 = 12**

- (a) Explain the working of mechanism, used to draw elliptical shape with neat sketch.
- (b) Differentiate between machine and structure on basis of :  
(1) Relative motion (2) Transmission of Energy (3) Degree of Freedom  
(4) Application
- (c) Explain : (1) Sensitiveness (2) Hunting of governor
- (d) With at least one example explain the terms : (1) self locking brake (2) self energizing brake.
- (e) Explain stepwise the method of drawing displacement diagram of Simple Harmonic Motion (SHM).

**4. Attempt any TWO of the following :**

**2 × 6 = 12**

- (a) Draw the Construction of Crank and Slotted lever mechanism and briefly explain its working.
- (b) In a four bar chain ABCD, AD is fixed and is 300 mm long. The crank AB is 80 mm long and rotates at 120 RPM clockwise, while the link CD which is 180 mm long oscillate about D. Link BC & AD are of equal length. Find angular velocity of link CD when angle BAD = 50°.
- (c) Draw a cam profile for knife edge follower :  
(1) Minimum radius of cam = 6 cm

- (2) Stroke of follower = 4 cm
- (3) Outstroke  $90^\circ$  with uniform velocity
- (4) Dwell for next  $60^\circ$
- (5) Follower return to original position during  $90^\circ$  of cam rotation with uniform velocity. The axis of cam and axis of knife edge are coincide  
cam rotates in clockwise direction.

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

**2 × 6 = 12**

- (a) Explain the phenomenon of (1) Slip of belt (2) Creep of belt
- (b) In a slider and crank mechanism the length of crank OB and connecting rod AB are 120 mm and 600 mm respectively. The crank rotates at 500 rpm in clockwise. Find the velocity and the acceleration by 'Klein's Construction' method only. Crank makes an angle of  $50^\circ$  to inner dead centre.
- (c) Draw neat labelled sketch of Porter Governor showing (1) Spindle (2) Dead weight (3) Flyball (4) Sleeve and explain its working.

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

**2 × 6 = 12**

- (a) Give the classification of gears mentioning the application of each.
  - (b) Draw neat labelled sketch of cone-clutch showing (1) Male cone (2) Female cone (3) Engine shaft (4) Spring (5) Friction surface (6) Splines and explain its working.
  - (c) Draw turning moment diagram for multi-cylinder engine and define :
    - (1) Mean effective pressure
    - (2) Fluctuation of energy
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