

22344

23124

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.

**Marks**

**1. Attempt any FIVE of the following :**

**10**

- (a) List the inversions of double slider crank mechanism.
- (b) Define kinematic link & kinematic chain.
- (c) State the inter-relation between
  - (i) Linear velocity and Angular velocity
  - (ii) Linear acceleration and Angular acceleration
- (d) State the types of cam.
- (e) Define pitch circle in cam.
- (f) State the function of clutch.
- (g) State the need for balancing of rotating elements of machine.

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

**12**

- (a) Explain with example completely constrained motion and successfully constrained motion.
- (b) Differentiate between belt drive and gear drive.



- (c) Cite the detailed classification of followers.
- (d) Describe with sketch construction of compound gear train and state the expression for speed ratio.

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

12

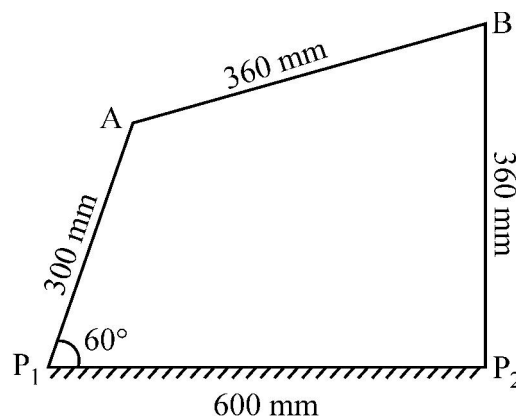
- (a) Explain the mechanism of rotary IC engine.
- (b) Draw the construction of Elliptical trammel.
- (c) Explain the principle of working of disc brake.
- (d) Distinguish between radial and cylindrical cam.
- (e) Explain the method of balancing of single rotating mass by single mass rotating in same plane.

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

12

- (a) Explain with neat sketch working of quick return mechanism of shaper.
- (b) The dimensions and configuration of the four bar mechanism shown in Fig. 1 are as follows :

$P_1A = 300$  mm,  $P_2B = 360$  mm,  $AB = 360$  mm &  $P_1P_2 = 600$  mm. The angle  $AP_1P_2 = 60^\circ$ . The crank  $P_1A$  has an angular velocity of 10 rad/s & angular acceleration of  $30$  rad/s<sup>2</sup> both clockwise. Determine the angular velocity & angular acceleration of AB.



**Fig. 1**

- (c) A cam with minimum radius 50 mm rotating clockwise at uniform speed is required to give a knife edge follower the motion as described below :
- (i) Outward stroke of 40 mm during 120° rotation of cam with SHM
  - (ii) Dwell for next 80°
  - (iii) Return stroke during next 90° with SHM
  - (iv) Dwell for remaining rotation of cam.

Draw the profile of cam when line of stroke of the follower is offset by 15 mm.

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

- (a) Explain the construction of epicyclic gear train & state its four applications.
- (b) The crank & connecting rod of a reciprocating engine are 200 mm & 700 mm respectively. The crank is rotating in clockwise direction at 120 rad/s. Find velocity & acceleration of slider using Klein's construction at the instant when crank is at 30° to inner dead centre.
- (c) Explain with sketch construction of centrifugal governor & its working.

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

- (a) In a flat belt drive the initial tension is 2000 N. The co-efficient of friction between the belt and pulley is 0.3 and angle of lap on smaller pulley is 150°. The smaller pulley has a radius 200 mm & rotates at 500 rpm. Find the power in kW transmitted by the belt.
  - (b) Explain with sketch construction of single plate clutch.
  - (c) Draw Turning moment diagram for single cylinder 4-stroke petrol engine and explain it.
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