

22438

21819

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.
 - (8) Use of steam tables, logarithmic, Mollier's chart is permitted.

Marks

- 1. Attempt any FIVE of the following: 10**
- a) Define term 'kinetics'.
 - b) List different types of 'kinematic pair'.
 - c) State the relation between relative velocity and motion of link in mechanism.
 - d) List any four applications of 'cam' and 'follower'.
 - e) Define the term 'Dwell' w.r.t cam profile.
 - f) State the functions of clutches.
 - g) Define coefficient of fluctuation of energy.

P.T.O.

- 2. Attempt any THREE of the following:** **12**
- a) Draw neat diagram of 'scotch yoke mechanism'? Explain its constructional features in brief.
 - b) Explain the term:
 - (i) Slip
 - (ii) Creep
 - c) Draw the following displacement diagram for follower:
 - (i) S.H.M
 - (ii) Uniform acceleration and deceleration
 - d) Differentiate between belt drive and gear drive.
- 3. Attempt any THREE of the following:** **12**
- a) Draw a neat sketch of 'Locomotive coupler' mechanism? Explain its working in brief.
 - b) Name the suitable mechanism to be used for following applications:
 - (i) Lifting water from well
 - (ii) Connecting misaligned shafts
 - (iii) Converting rotary motion into reciprocating motion
 - (iv) Maintain constant relative motion between two rotary elements
 - c) Explain the construction of 'Disc brake' with neat sketch.
 - d) Draw basic 'cam-follower' diagram showing its terminology (Mini four terminology).
 - e) State the necessity of Balancing. List different types of Balancing methods.

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

- a) Draw the labelled diagram of Crank and slotted lever Quick Return Mechanism.
- b) A crank of slider crank mechanism rotates clock wise at constant speed of 300 rpm. The crank is 150 mm and connecting rod is 600 mm long.

Determine:

- (i) Linear velocity of the midpoint of connecting rod.
- (ii) Angular acceleration of connecting rod at a crank angle of 45° from inner dead centre position.
- c) Draw the profile of cam operating a knife edged follower from following data:
- (i) Follower to move outwards through 40mm during 60° of cam rotation.
- (ii) Follower dwell for next 45° .
- (iii) Follower to return to its original position during next 90° .
- (iv) Follower to dwell for rest of the rotation. The displacement of follower is to take place with simple harmonic motion during both outward and return strokes. The least radius of cam is 50 mm. If the cam rotates at 300 rpm.

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

- a) Two parallel shafts whose centre lines are 4.8 m apart are connected by open belt drive. The diameter of larger pulley is 1.5 m and that of smaller pulley 1 m. The initial tension in the belt when stationary is 3 kN. The mass of the belt is 1.5 kg/m length. The coeff of friction between belt and pulley is 0.3. Taking centrifugal tension in to account. Calculate power transmitted when smaller pulley rotates at 400 rpm.

- b) A 4-bar mechanism has following dimensions:

$$l(\text{DA}) = 300 \text{ mm} \quad l(\text{CB}) = l(\text{AB}) = 360 \text{ mm}$$

$l(\text{DC}) = 600 \text{ mm}$. The link 'DC' is fixed. The angle ADC is 60°

The driving link 'DA' rotates at a speed of 100 rpm clockwise and constant driving torque is 50 N.M. Calculate the Velocity of point 'B' and angular velocity of driven link 'CB'.

- c) Explain the following terms of centrifugal governor with neat sketch:
- Height of governor
 - Equilibrium speed
 - Sleeve lift

6. Attempt any TWO of the following:

12

- a) Two pulleys one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1.95 m apart and are connected by a crossed belt. Find the length of belt required and angle of contact between belt and each pulley.
Estimate the power transmitted by belt when the larger pulley rotates at 200 rpm. If the maximum tension in the belt is 1 kN and coeff of friction between belt and pulley is 0.25.
- b) Draw the constructional details diagram of centrifugal clutch. Explain its working principle
- c) The weights of four masses A, B, C, D are 200 kg, 300 kg, 240 kg, 260 kg respectively. The corresponding radii of rotation are 200 mm, 150 mm, 250 mm and 300 mm respectively and the angle between successive masses are 45° , 75° and 135° . Find the position and magnitude of the balance weight required if its radius of rotation is 200 mm.
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