

22344

23242

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.

Marks

- 1. Attempt any FIVE of the following :** **10**
 - (a) Define kinematics and kinetics.
 - (b) Enlist any 4 inversions of single slider crank chain.
 - (c) Write the inter-relation between linear acceleration and angular acceleration.
 - (d) Define Lift of a follower.
 - (e) State any 4 applications of cams and followers.
 - (f) State any 2 applications of brakes.
 - (g) Define co-efficient of fluctuation of speed.

- 2. Attempt any THREE of the following :** **12**
 - (a) Compare completely constrained motion with successfully constrained motion.
 - (b) Describe any 2 methods of lubrication of chain drive.



- (c) Explain the following terms with neat sketch for a cam with roller follower :
- (i) Pitch circle
 - (ii) Prime circle
- (d) Differentiate between Simple gear train and compound gear train.

3. Attempt any THREE of the following :

12

- (a) Differentiate between a machine and a structure.
- (b) Explain Scotch yoke mechanism with neat labelled sketch.
- (c) Explain the construction and working of a disc brake with neat sketch.
- (d) Classify different types of followers according to surface in contact with the cams.
- (e) Explain the working of a centrifugal governor with neat sketch.

4. Attempt any TWO of the following :

12

- (a) Explain beam engine mechanism with neat labelled sketch.
- (b) In a four bar chain ABCD, AD is fixed and is 60 mm long. The crank AB is 16 mm long and rotates at 120 RPM clockwise, while the link CD which is 36 mm long oscillate about D. Link BC and AD are of equal length. Find angular velocity of link CD when angle BAD = 50° .
- (c) Draw the cam profile with knife edge follower to describe the following motions :
 - (i) Follower to move outwards through 40 mm during 120° of cam rotation.
 - (ii) Follower to dwell for next 60° of cam rotation.
 - (iii) Follower to return to its initial position in the next 120° of cam rotation.
 - (iv) Follower to dwell for rest of cam rotation.

The minimum radius of cam is 50 mm. Displacement of follower takes place with uniform velocity for both the outward and inward stroke.

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

- (a) Two pulleys of 250 mm and 100 mm diameter are mounted on parallel shafts 1400 mm apart and are connected by a simple belt. Find the length of belt required and the angle of contact between belt and each pulley.

Also determine the amount of power that can be transmitted by the belt when smaller pulley rotates at 400 rpm, if maximum permissible tension in the belt is 1 kN and coefficient of friction between the belt & pulley is 0.30.

- (b) In the engine mechanism, crank $OB = 20$ mm, length of connecting rod = 90 mm. The centre of gravity of the rod is at 'G' which is 30 mm from 'B'. The speed of crank is 100 rpm and the crank OB is rotated at 45° from 'OA'. Find out the velocity of point 'G' and angular velocity of AB .

- (c) Four masses are 10 kg, 40 kg, 20 kg and 60 kg are attached to the shaft and revolve in the same plane. The corresponding radii of rotation are 0.25 m, 0.35 m, 0.45 m and 0.10 m respectively. The angles between successive masses are 35° , 70° and 150° .

Find the position and magnitude of balance mass required, if its radius of rotation is 0.25 m. Use graphical method.

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

- (a) In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m. in the anticlockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed, makes 300 r.p.m. in the clockwise direction, what will be the speed of gear B ?

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- (b) A single plate clutch, with both sides effective, has outer and inner diameters 500 mm and 250 mm respectively. The maximum intensity of pressure at any point in the contact surface is not to exceed 0.25 N/mm^2 . If the coefficient of friction is 0.25, determine the power transmitted by clutch at a speed of 3000 r.p.m.
- (c) Explain the turning-moment diagram for a single cylinder 04 stroke IC engine.
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