

22344

24225

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 :

10

- (a) Define and state example of each of the following :
 - (i) Rigid link
 - (ii) Flexible link
- (b) Define completely constrained motion with appropriate example.
- (c) State Kennedy's theorem and relation between number of instantaneous centre and number of links.
- (d) Define following terms used in cams :
 - (i) Base circle
 - (ii) Pressure angle
- (e) State types of followers according to the surface in contact.
- (f) State all the factors on which the amount of power transmitted depends upon in belt drive.



(g) Define :

(i) Flywheel

(ii) Governor

2. Attempt any THREE :

12

(a) Differentiate between Machine & Mechanism.

(b) Describe disc cam and cylindrical cam with neat sketch.

(c) Distinguish between Belt drive and Gear drive.

(d) Describe working of internal expanding brake with neat sketch.

3. Attempt any THREE :

12

(a) Describe Turning moment diagram for four stroke cycle I.C. engine.

(b) In a four bar chain ABCD, AD is fixed and 150 mm long. The crank AB is 40 mm long and rotates at 120 rpm. clockwise. Link CD = 80 mm oscillates about D. BC and AD are equal in length. Find angular velocity of link CD when $\angle BAD = 60^\circ$.

(c) Define the following :

(i) Rolling pair

(ii) Spherical pair

(iii) Hunting of Governor

(iv) Equilibrium speed

(d) A single plate clutch, effective on both sides has outer & inner diameters 300 mm & 200 mm respectively. The max. intensity of pressure is not to exceed 0.1 N/mm^2 . If coefficient of friction is 0.3, determine torque transmitted by clutch.

4. Attempt any THREE :**12**

- (a) Define brake and state types of mechanical brakes.
- (b) Attempt both :
 - (i) State any two advantages of 'V' belt drive over flat belt drive.
 - (ii) Define slip and creep of Belt.
- (c) Differentiate between Governor & flywheel.
- (d) Define Inversions of mechanism and state inversions of single slider crank chain with its applications.

5. Attempt any TWO :**12**

- (a) Four masses A, B, C & D are attached to a shaft and revolve in same plane. The masses are 12 kg, 10 kg, 18 kg and 15 kg respectively and their radii of rotations are 40 mm, 50 mm, 60 mm & 30 mm. The angular position of masses B, C and D are 60° , 135° & 270° from mass 'A'. Find the magnitude and position of the balancing mass at a radius of 100 mm.
- (b) A leather belt is 125 mm wide and 6 mm thick, it transmits power from 750 mm diameter pulley which runs at 500 rpm. The angle of lap is 150° and coefficient of friction is 0.3. If mass of 1 m^3 of leather is 1 kg and stress in the belt is not to exceed 2.75 Mpa, find max. power that can be transmitted by the belt.
- (c) Attempt the following :
 - (i) Describe compound gear train.
 - (ii) State advantage of compound gear train over simple gear train.
 - (iii) Define "Dynamics".

6. Attempt any TWO :**12**

- (a) In slider crank mechanism length of a crank and connecting rod is 30 mm and 120 mm. The crank rotates at 180 rpm clockwise. When crank rotates at 45° from inner dead centre, find velocity and acceleration of slider using Klein's construction.
- (b) A cam operating a knife-edge follower has following data :
- (i) Follower moves outwards through 40 mm during 60° of cam rotation.
 - (ii) Follower dwells for next 45° .
 - (iii) Follower returns to original position during next 90° .
 - (iv) Follower dwells for rest of the rotation.

The displacement of follower is to take place with S.H.M. during both outward & return stroke. List radius of cam is 50 mm. Draw cam profile when axis of follower passes through axis of cam.

- (c) Attempt the following :
- (i) Follower moves with uniform acceleration and retardation during outward & return stroke, each corresponds to 60° of cam rotation. The follower must be dwell at fully outward position for 20° of cam rotation. The lift of follower is 37.5 mm.

Draw Displacement diagram.

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- (ii) Define Coriolis component of acceleration and state the condition where it must be calculated.

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- (d) Describe Whitworth Quick Return mechanism with neat sketch.
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