22344

**12425**

**3 Hours / 70 Marks** Seat No. | | | | | | | | |

***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.

**Marks**

**1. Attempt any FIVE :** **5 × 2 = 10**

(a) Identify the type of constrained motion in the following examples :

(i) Motion of piston inside the engine cylinder

(ii) Shaft in footstep bearing

(b) Enlist any one example of a quadric cycle chain with a suitable sketch.

(c) Define the rubbing velocity at a pin joint.

(d) Suggest the appropriate type of cam-follower used in the following applications :

(i) Automobile Engine

(ii) Aircraft Engine

(e) Enlist the types of motion with which the follower can move.

(f) Give the significance of cross belt drive with a simple labelled sketch.

(g) List down any two disadvantages of chain drive.

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

(a) Sketch and explain any one inversion of double slider crank chain.

(b) Define the following terms as applied to cam :

(i) Base circle

(ii) Pressure angle

(iii) Lift

(iv) Prime circle

(c) Find the power transmitted by a belt running over a pulley of 600 mm diameter at 200 rpm. The coefficient of friction between the belt and pulley is 0.25, the angle of lap 160°, and the maximum tension in the belt is 2500 N.

(d) Distinguish between belt & gear drive with respective to the following parameters :

(i) Velocity ratio

(ii) Power transmission

(iii) Efficiency

(iv) Space required

**3. Attempt any THREE :** **3 × 4 = 12**

(a) Identify the kinematic chains to which the following mechanism belongs :

(i) Beam engine

(ii) Bull engine

(iii) Oldham's coupling

(iv) Coupling rod of locomotives

(b) Differentiate between higher & lower pair with suitable examples.

(c) Explain the flat and spherical faced follower with a suitable sketch.

(d) Distinguish between single & multiple clutch with respective to the following parameter :

(i) Number of plates

(ii) Size & space

(iii) Torque Transmission

(iv) Application

(e) Draw and explain the turning moment diagram of a single cylinder four stroke I.C. Engine.

**4. Attempt any TWO :** **2 × 6 = 12**

(a) Explain with a neat sketch, the construction and working of the crank & slotted lever quick return motion mechanism.

(b) In a single slider mechanism, the crank OB & connecting rod AB lengths are 125 mm & 500 mm, respectively. The centre of gravity G of the connecting rod is 275 mm from the slider A. The crank speed is 600 rpm clockwise. When the crank has turned 45° from the inner dead centre position,

Determine :

(i) Velocity of the slider A

(ii) Velocity of the point G

(iii) Angular velocity of the connecting rod AB.

(c) Draw the cam profile, when the line of stroke of the knife edge follower passes through the axis of the camshaft, with the following data :

(i) Cam lift = 40 mm during 90° of cam rotation with SHM

(ii) Dwell for the next 30°

(iii) During the next 60° of cam rotation, the follower returns to its original position with SHM.

(iv) Dwell during the remaining 180°

**5. Attempt any TWO :** **2 × 6 = 12**

(a) The crank & connecting rod of a reciprocating engine are 200 mm & 700 mm respectively. The crank is rotating in a clockwise direction at 120 rad/s. Find with the help of Klein's construction :

(i) Velocity & acceleration of the piston

(ii) Velocity and acceleration of the mid point of the connecting rod.

(b) Enlist the types of chains and explain with suitable sketches, power transmission chains.

(c) Differentiate between flywheel & governor with respective technical parameters.

**6. Attempt any TWO :** **2 × 6 = 12**

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

(b) Explain with neat sketch, construction & working of the centrifugal clutch.

(c) Four masses A, B, C, and D are attached to a shaft and revolve in the same plane. The masses are 12 kg, 10 kg, 18 kg and 15 kg respectively & their radii of rotations are 40 mm, 50 mm, 60 mm & 30 mm. The angular position of the masses B, C & D are 60°, 135° & 270° from the mass A. Find the magnitude & position of the balancing mass at a radius of 100 mm.

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