22438

24225

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.

(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.

Marks

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

(a) List the types of Kinematic Chains and state one inversion of each.

(b) Define :

(i) Kinematic Link

(ii) Kinematic Pair

(c) Define :

(i) Angular Velocity

(ii) Angular Acceleration

(d) State any four types of Followers.

(e) State the function of Flywheel.

(f) State any four advantages of V belt drive.

(g) State necessity of balancing of parts which rotates at high speed.

2. Attempt any THREE of the following : 3 × 4 = 12

(a) Explain with neat sketch the Coupling Rod of Locomotive (Locomotive coupler).

(b) Differentiate between Flat Belt Drive and V Belt Drive (any four points).

(c) With respect to Cam Profile, define following terms :

(i) Cam Profile

(ii) Prime Circle

(iii) Lift of Cam

(iv) Pressure Angle

(d) Explain Reverted Gear Train with neat sketch.

3. Attempt any THREE of the following : 3 × 4 = 12

(a) Name the various types of Constrained Motion and explain Successfully Constrained Motion with a neat sketch.

(b) Explain working of Scotch Yoke Mechanism with a neat sketch.

(c) Classify the different types of Clutches.

(d) Give the classification of Followers as per

(i) The shape of the follower

(ii) The path of motion of the follower with respect to Cam axis

(e) Differentiate between Flywheel & Governor (any four points).

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

(a) Draw a neat sketch of Crank and Slotted Lever Quick Return mechanism and label it.

(b) The dimension and configuration of four bar mechanism is shown in the Figure No. 1. The crank is rotating with uniform speed of 100 RPM clockwise. Determine the angular velocity of link BC and absolute velocity of point B.

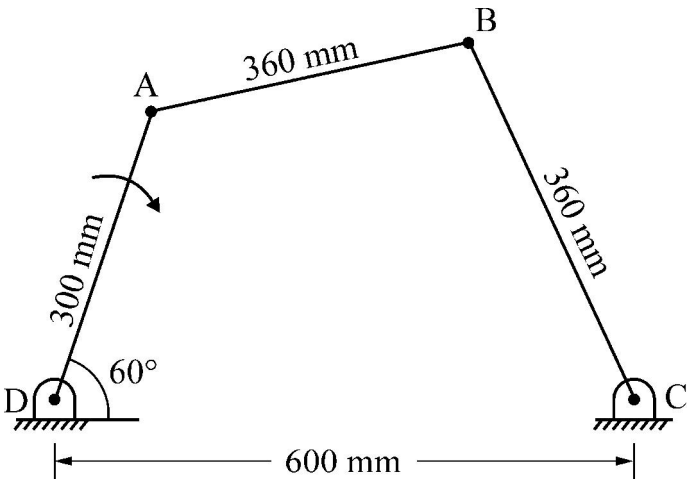

Figure No. 1

(c) A cam drives a knife edge follower in the following manner (i) During first 120° of cam rotation, follower moves outwards through a distance of 40 mm (ii) The follower dwells during next 30° of cam rotation (iii) During next 120° cam rotation the follower moves inwards (iv) The follower dwells for next 90° of cam rotation. During Outward and Inward stroke the follower moves with Uniform Acceleration and Retardation. The minimum radius of cam is 25 mm. Draw the profile of cam when the axis of the follower passes through the axis of the camshaft.

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

(a) State merits and demerits of Gear drive.

(b) A single slider mechanism is shown in Figure No. – 2. The crank CB is 100 mm long and the connecting rod AB is 300 mm long. In the position shown in figure, the crank rotates with a uniform speed of 75 rad/sec. By using Klein's Construction method, find :

(i) Acceleration & Velocity of mid point of Connecting rod AB

(ii) Angular Velocity of link AB

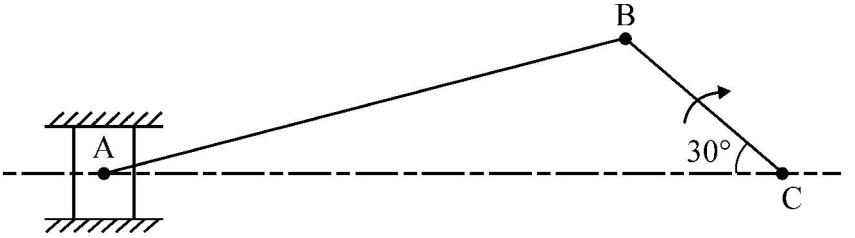

Figure No. 2

(c) Explain with neat sketch construction and working of Centrifugal governor.

6. Attempt any TWO of the following : **2 × 6 = 12**

(a) A shaft carries four masses m_1, m_2, m_3, m_4 of 200 N, 300 N, 240 N and 260 N respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively. The angles between successive masses are 45°, 75° & 135°. Find the position and magnitude of the balancing mass required, if its radius of rotation is 0.2 m. Use graphical method.

(b) With the help of neat sketch, explain Single Plate Clutch.

(c) Two pulleys with diameters 450 mm & 200 mm respectively, are mounted on two parallel shafts which are 1.95 m apart & are connected by cross belt drive. Find the length of belt required and angle of contact between the belt and each pulley.

What power can be transmitted by the belt when the larger pulley rotates at 200 rpm, if maximum permissible tension in the belt is 1000 N. Take $\mu = 0.25$.
