



Instructions to candidates

Duration: Two (02) hours

Number of questions: Four (04)

Mark allocation: 100 Marks

Answer all questions

1.
 Figure 1 shows a Whitworth quick return motion mechanism. The various dimensions in the mechanism are as follows : $OQ = 100 \text{ mm}$; $OA = 200 \text{ mm}$; $QC = 150 \text{ mm}$; and $CD = 500 \text{ mm}$. The crank OA makes an angle of 60° with the vertical and rotates at 120 r.p.m. in the clockwise direction. Locate all the instantaneous centres and find the velocity of ram D .

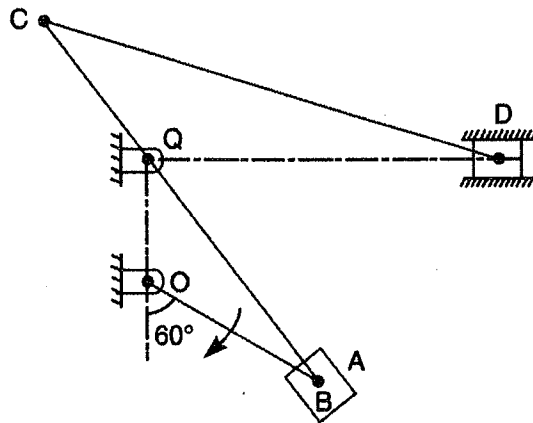


Figure 1

(25 marks)

2.
 In Figure 2, the angular velocity of the crank OA is 600 r.p.m. Determine the linear velocity of the slider D and the angular velocity of the link BD , when the crank is inclined at an angle of 75° to the vertical. The dimensions of various links are : $OA = 28 \text{ mm}$; $AB = 44 \text{ mm}$; $BC = 49 \text{ mm}$; and $BD = 46 \text{ mm}$. The centre distance between the centres of rotation O and C is 65 mm. The path of travel of the slider is 11 mm below the fixed point C . The slider moves along a horizontal path and OC is vertical.

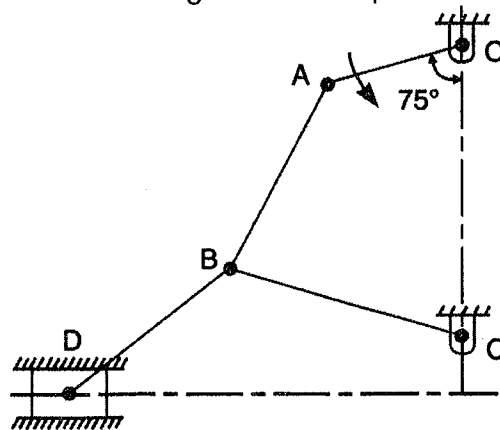


Figure 2

(25 marks)

3. In the mechanism, as shown in Figure 3, the crank OA rotates at 20 r.p.m. anticlockwise and gives motion to the sliding blocks B and D. The dimensions of the various links are OA = 300 mm; AB = 1200 mm; BC = 450 mm and CD = 450 mm.

For the given configuration, determine :

- (a) velocities of sliding at B and D.
- (b) The angular velocity of CD.
- (c) linear acceleration of D.
- (d) angular acceleration of CD.

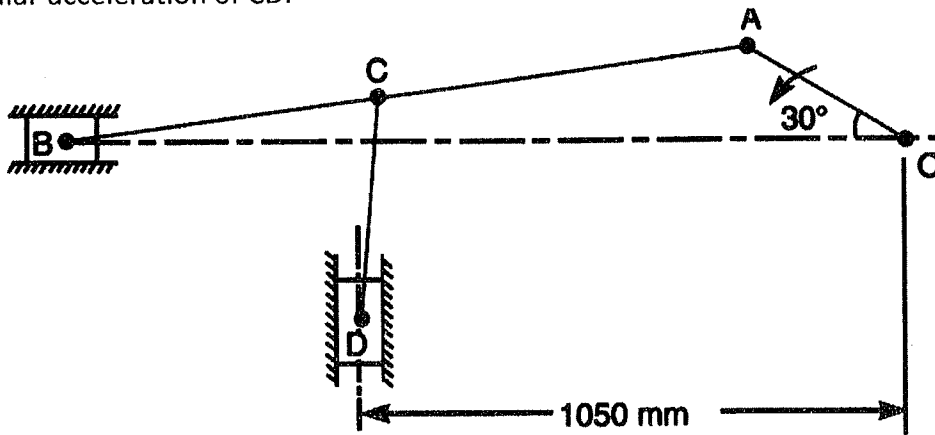


Figure 3

(25 marks)

4. The turning moment diagram for a petrol engine is drawn to the following scales: Turning moment, 1 mm = 5 Nm; crank angle, 1 mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are 295, 685, 40, 340, 960, 270 mm². The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m.

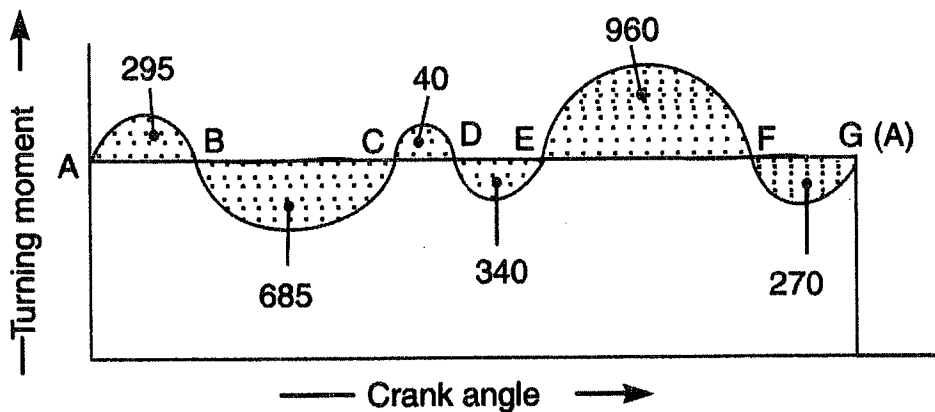


Figure 4

(25 marks)

