

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Classify kinematic pairs based on degrees of freedom. (10)
 (ii) What is inversion and list its properties. (2 + 4)

OR

- (b) (i) Find the degrees of freedom of the mechanisms shown in fig. 11 (b). (10)
 (ii) State the inconsistencies of Grubler's criterion. (6)

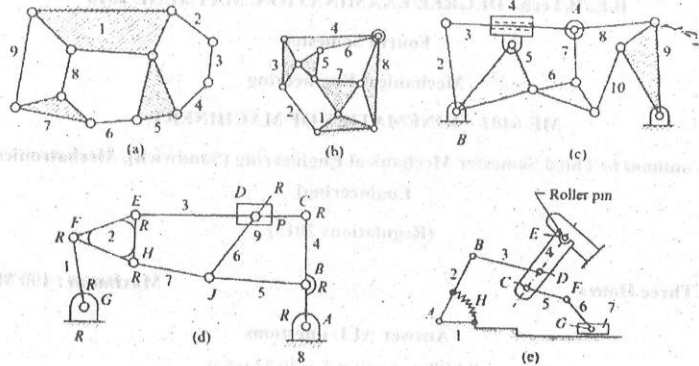


Fig 11 (b)

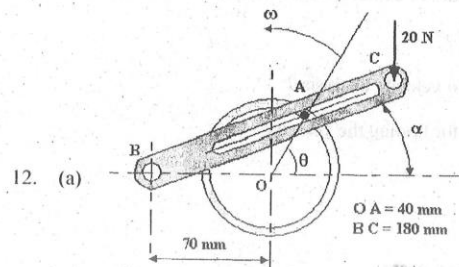


Figure 12 (a)

The diagram shows part of a quick return mechanism. The pin A slides in the slot when the disc is rotated. Calculate the angular velocity and acceleration of link BC when $\theta = 60^\circ$ and $\omega = 100$ rad/s. (16)

OR

- (b) Derive the expression for Coriolis component of acceleration with neat sketch and give its direction for various conditions. (16)

13. (a) (i) Draw the displacement, velocity and acceleration curves, when the follower moves with simple harmonic motion and derive the expression for maximum velocity and maximum acceleration. (10)
 (ii) Depict the types of cams. (6)

OR

- (b) Follower type = roller follower, lift = 25 mm; base circle radius = 20 mm; roller radius = 5 mm; out stroke with UARM, for 120° cam rotation; dwell for 60° cam rotation; return stroke with UARM, for 90° cam rotation; dwell for the remaining period. Determine max. velocity and acceleration during out stroke and return stroke if the cam rotates at 1200 rpm in counter clockwise direction.

Draw the cam profile for conditions with follower off set to right of cam center by 5 mm. (16)

14. (a) The cutter of a broaching machine is pulled by square threaded screw of 55 mm external diameter and 10 mm pitch. The operating nut takes the axial load of 400 N on a flat surface of 60 mm internal diameter and 90 mm external diameter. If the coefficient of friction is 0.15 for all contact surfaces on the nut, determine the power required to rotate the operating nut, when the cutting speed is 6 m/min. (16)

OR

- (b) Following data is given for a rope pulley transmitting 23.628 kW.
 Dia of pulley = 40 cm; speed = 110 rpm, angle of groove = 45° ; angle of lap = 60° , coefficient of friction = 0.28, No. of ropes = 10. Mass in kg/m length of ropes = $0.0053 \times C^2$ and working tension is limited $12.2 C^2$ N where C = girth of rope in cm. Find (i) initial tension, and (ii) diameter of each rope. (16)

15. (a) Explain gear nomenclature with neat diagram and define all salient terms pertaining to the gear. (16)

OR