UNIT – I

1. (a) How are the whitworth quick return mechanism and crank and slotted – lever mechanism different from each other **[7M]**

   (b) In a crank and slotted lever quick return mechanism, the distance between the fixed centers is 240mm and the length of the driving crank is 120 mm. Determine the inclination of the slotted bar with the vertical in the extreme position and the time ratio of cutting stroke to return stroke. **[7M]**

2. (a) Explain any two inversion of double slider crank chain. **[7M]**

   (b) Prove that a point on one of links of a hart mechanism traces a straight line on the movement of its links. **[7M]**

UNIT – II

3. (a) Explain the method of determining the Coriolis component of acceleration in crank and slotted lever quick return mechanism. **[7M]**

   (b) In a slider crank mechanism, the crank OA makes 400 rpm in the counter clockwise direction which is 600 from IDC. The lengths of the links are OA= 60 mm, OB= 220 mm and BA= 280 mm. Determine the velocity and acceleration of the slider B. **[7M]**

4. (a) Describe the procedure to locate the Instantaneous center in a mechanism. **[7M]**

   (b) In Slider crank mechanism the lengths of the crank and the connecting rod are 200mm and 800 mm respectively. Locate all the I-centers of the mechanism for the position of the crank when it has turned 30^0 from the inner dead center. Also, find the velocity of the slider and the angular velocity of the connecting rod if the crank rotates at 40 rad/s. **[7M]**

UNIT – III

5. (a) What do you mean by fixed centrode and moving centrode? Explain. **[7M]**

   (b) The distance between the steering pivots of a Davis steering gear is 1.3 m. The wheel base is 2.75 m. what will be the inclination of the track arms to the longitudinal axis of the vehicle moving in a straight path. **[7M]**

6. (a) Explain in what way the gyroscopic couple affects the motion of an aircraft while taking a turn. **[7M]**

(b) A hooks joint connects two shafts whose axes intersect at 25^0. What will be the angle turned by the driven shaft when the velocity ratio is maximum, minimum and unity. **[7M]**

UNIT – IV

7. (a) What are cams? Explain types of cams with a neat sketch. **[7M]**

(b) A cam has straight working faces which are tangential to a base circle of diameter 90 mm. The follower is a roller of diameter 40 mm and the centre of roller moves along a straight line passing through the centre line of the cam shaft. The angle between the tangential faces of the cam is 90^0 and the faces are joined by a nose circle of 10 mm radius. The speed of rotation of the cam is 120 revolutions per min. Find the acceleration of the roller centre. **[7M]**

8. (a) Explain in detail about equivalent mechanism for a cam and follower. **[7M]**

(b) It is required to set out the profile of a cam to give the following motion to the reciprocating follower with a flat mushroom contact face : (i) Follower to have a stroke of 20 mm during 120^0 of cam rotation ; (ii) Follower to dwell for 30^0 of cam rotation ; (iii) Follower to return to its initial position during 120^0 of cam rotation ; and (iv) Follower to dwell for remaining 90^0 of cam rotation. The minimum radius of the cam is 25 mm. The out stroke of the follower is performed with simple harmonic motion and the return stroke with equal uniform acceleration and retardation. **[7M]**

UNIT – V

9. (a) Deduce expression for the maximum efficiency of helical gears. **[7M]**

(b) The center distance between two meshing spiral gears is 260mm and the angle between the shafts is 65^0. The normal circular pitch is 14mm and the gear ratio is 2.5. The driven gear has a helix angle of 35^0. Find the i) number of teeth on each wheel ii) exact center distance iii) efficiency assuming the friction angle to be 5.5^0. **[7M]**

10. (a) Explain the terms module, pressure angle and addendum in gears. Explain the method of eliminating interference in gears **[7M]**

(b) A pair 20^0 full depth involute spur gear having 30 and 50 teeth respectively module 4 mm arc in mesh, the smaller gear rotates at 1000 rpm. Determine (i) Sliding velocities at engagement and disengagement of a pair of teeth and (ii) Contact ratio **[7M]**

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