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Question Paper Code : 31559

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Third Semester

Mechanical Engineering

ME 2203/ME 35/10122 ME 404/ME 1202 A/080120010 — KINEMATICS OF MACHINERY

(Regulation 2008/2010)

(Common to PTME 2203 – Kinematics of Machinery for B.E. (Part-Time) Third Semester – Mechanical Engineering – Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define sliding connectors.

2. Differentiate rotation and translation.

3. Define number of instantaneous centre.

4. What is low degree of complexity?

5. Define pressure angle.

6. Write the procedure to draw the cam profile.

7. Define gear ratio.

8. Write short notes on differentials.

9. Define anti -friction bearing.

10. Differentiate multiplate clutch and cone clutch.

PART B — (5 × 16 = 80 marks)

11. (a) (i) What is kinematic inversion? Explain the four different inversions of slider crank mechanism. (10)

(ii) Determine the degree of freedom for following linkages. (Fig.1) (6)

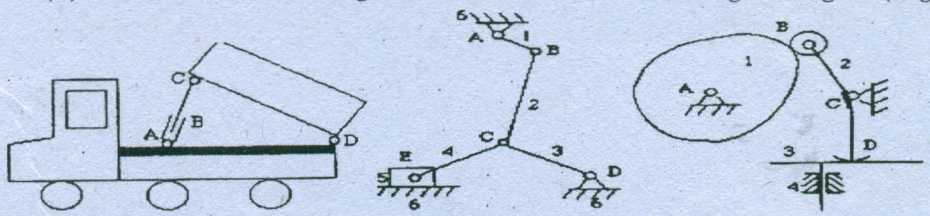

Fig.1

Or

(b) (i) Find the maximum and minimum transmission angles for the mechanisms shown in fig.2. The figures indicate the dimensions in standard units of length. (8)

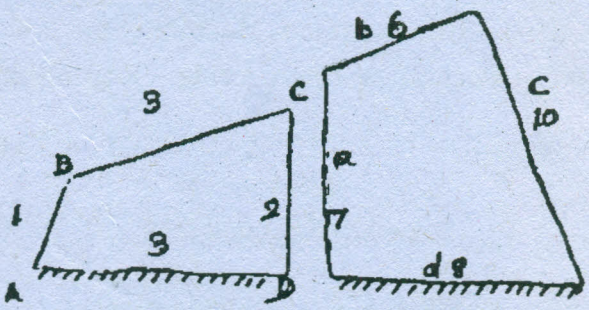

Fig. 2

(ii) Write short notes on toggle mechanism. (8)

12. (a) (i) The crank AB of four bar mechanism shown in figure. 3. Rotates at 60 rpm clockwise. Determine the relative angular velocities of the coupler to the crank and the lever to the coupler. Find also the rubbing velocities al the surface of pins 25 mm radius and the joints B and C. (8)

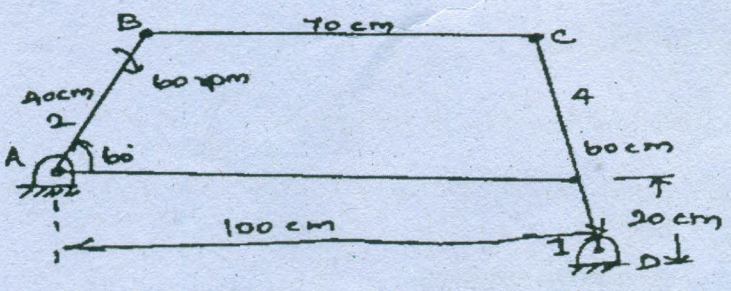

Fig. 3

(ii) Locate the instantaneous centre's of the slider crank mechanism shown in fig.4. Find the velocity of the slider. (8)

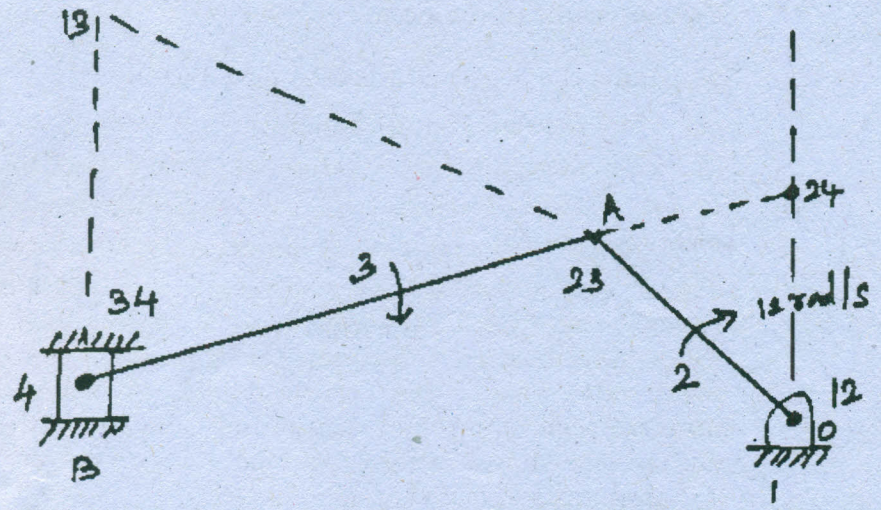

Fig. 4

Or

(b) (i) Fig.5 shows the configuration of a whit worth quick return mechanism. The lengths of the fixed link OA and the crank OP are 200 mm and 300mm respectively. Other lengths are AR=200 mm and RS=400 mm. Find the velocity of the ram using instantaneous centre method when the crank makes a angle of 120° with the fixed link and rotates at 10 rad/s.

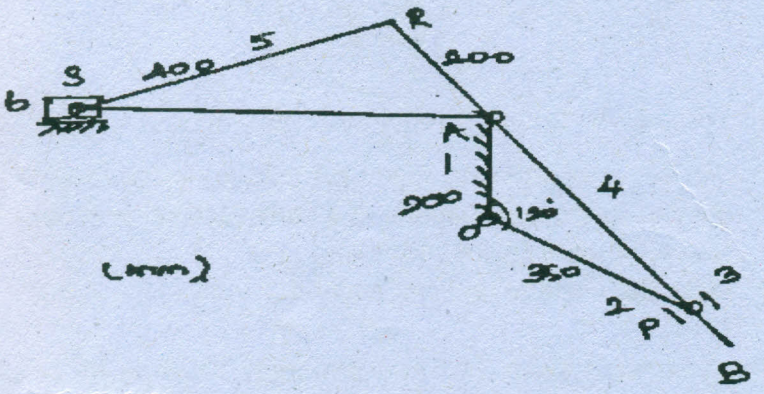

Fig. 5

(ii) Differentiate low degree and high degree of complexity with suitable sketch. (6)

13. (a) A cam operates on offset roller follower. The least radius of the cam is 50 mm, roller diameter is 30 mm, and offset is 20 mm, the cam rotates at 360 rpm. The angle of ascent is 48°, angle of dwell is 42°, and angle of descent is 60°. The motion is to be SHM during ascent and uniform acceleration and deceleration during decent. Draw the cam profile. (16)

Or

(b) (i) A flat faced mushroom follower is operated by a symmetrical cam with circular arc flank and nose profile the axis of tappet passed through the cam axis. Total angle of action is 162°, lift 10 mm and base circle diameter 40 mm. period of acceleration is half the period of retardation during the lift. The cam rotates at 1200 rpm. Determine

(1) The nose and flank radii and

(2) The maximum acceleration and retardation during lift. (12)

(ii) List the various methods to be used to reduce the pressure angle. (4)

14. (a) (i) Explain the various pitches of helical gears with sketch. (10)

(ii) Two 15 mm module 20° pressure angle spur gears have addendum equal to one module. The pinion has 25 teeth and the gear 50 teeth. Determine whether interference will occur or not. If it occurs, to what valve should the pressure angle be changed to eliminate interference? (6)

Or

(b) (i) An epicyclic gear train consists of three gears 1, 2 and 3 as shown in fig.6 the internal gear 1 has 72 teeth and gear 3 has 32 teeth. The gear 2 meshes with both gear 1 and gear 3 and is carried on an arm A. which rotates about the centre O_2 at 20 rpm. If the gear 1 is fixed, determine the speed of gears 2 and 3. (12)

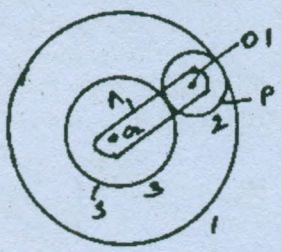

Fig. 6

(ii) Write short notes on speed ratio of a planetary gear train. (4)

15. (a) (i) Derive the force analysis of a body resting on an inclined plane with force inclined to the plane. (12)

(ii) List the various types of friction. (4)

Or

(b) (i) A vertical shaft 140 mm diameter rotating at 120 rpm rests on a flat end foot step bearing. The shaft carries a vertical load of 30 KN. The coefficient of friction is 0.06. Estimate the power lost is friction, assuming uniform pressure and uniform wear. (8)

(ii) A multi-plate disc clutch transmits 55 KW of power at 1800 rpm. Coefficient of friction for the friction surface is 0.1. Axial intensity of pressure is not to exceed 160 KN/m^2. The internal radius is 80 mm and 0.7 times the external radius. Find the number of plates needed to transmit the required torque. (8)
