SIDDHARTH INSTITUTE OF ENGINEERNG & TECHNOLOGY :: PUTTUR

(AUTONOMOUS)

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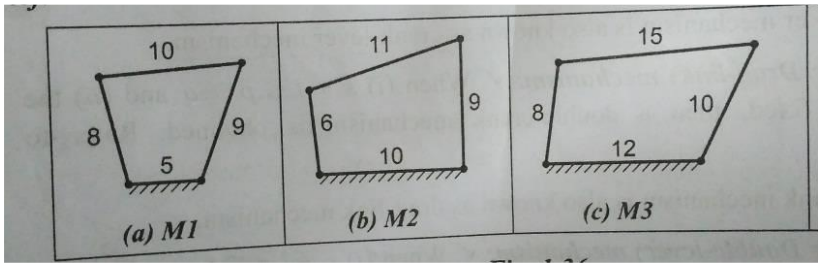
QUESTION BANK (DESCRIPTIVE)

Subject Code :KOM (18ME0304) **Course & Branch :**B.Tech – ME

Year &Sem : II – B.Tech& I –Sem **Regulation :** R18

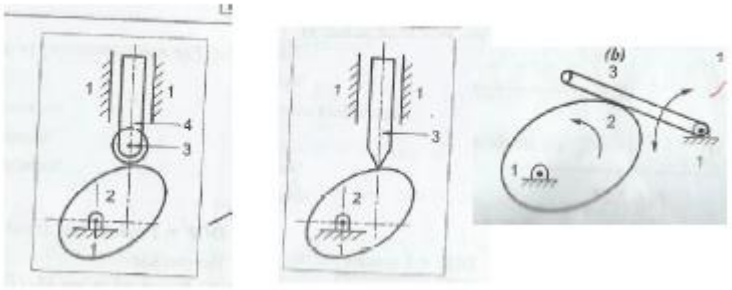
UNIT – I

1.	**a.**	Name the classification of the kinematics pairs with all the aspect.	2M
	b.	What is kutzbackcriterion ?	2M
	c.	Explain DOF with Equation?	2M
	d.	Draw the schematic of beam engine?	2M
	e.	Write the Applications of single slider crank mechanism.	2M
2.		Explain the inversions of double slider crank chain with neat sketch and list out the practical applications of inversions.	10M
3.	**a.**	What is pantograph? Show that it generates a path similar to the path traced by a point on the mechanism.	5M
	b.	What is constrained motion and what are the different types of constrained motions? Give one example for each with suitable sketch.	5M
4.		Explain the inversions of single slider crank chain with neat sketch and list out the practical applications of inversions?	10M
5.		What are the practical applications of inversions of the 4 – bar linkage? Explain all with neat sketch.	10M
6.		What are the practical applications of inversions of the single slider crank chain? Explain all with neat sketch.	10M
7.		What are the practical applications of inversions of the double slider crank chain? Explain all with neat sketch.	10M
8.	**a.**	Define the Grashof's law and identify the mechanism produced by the following linkage.	5M



b. Explain about the Kutzbach criterion and why it is used? Show the proof? 5M

9. Define the term 'Degrees of Freedom'. And find the degrees of freedom for the following linkages. 10M



10. a. Explain the working of beam engine with neat sketch 5M

b. Explain the working of Oscillating cylinder engine with neat sketch 5M

UNIT – II

1.	**a.**	What is the condition for correct steering? Write fundamental equation of it.	2M
	b.	Give a neat sketch of the straight line motion Hart mechanism.	2M
	c.	What is the different between exact and approximate straight line motion?	2M
	d.	What is hook's joint?	2M
	e.	Name the any two examples for exact and approximate straight line motion.	2M
2.		With neat sketch, explain the Ackerman steering gear of an automobile.	10M
3.		With neat sketch, explain the Davis steering gear of an automobile.	10M
4.	**a.**	Sketch and explain the working of Grasshopper straight line mechanism	5M
	b.	Sketch and Describe the working of Peaucellier mechanism	5M
5.		Sketch and Describe the Scott-Russell and Robert's straight-line motion mechanisms.	10M
6.	**a.**	Sketch and Describe the watt mechanism	5M
	b.	Sketch and Describe the Tchebichef mechanism	5M
7.	**a.**	Differentiate between the Davis and Ackerman's steering mechanism	5M
	b.	What are the disadvantages of Davis steering gear mechanism	5M
8.		With neat sketch, explain the working of Universal joint. And write applications also.	10M
9.		With neat sketch, explain the working of any two of approximate straight line mechanisms.	10M
10		With neat sketch, explain the working of any two of exact straight line mechanisms	10M

UNIT - III

1. **a.** How tangential and normal components of accelerations for point on a link can be determined 2M

b. What do you understand by velocity image of a link? 2M

c. What is coriolis component of Acceleration? 2M

d. Differentiate displacement, velocity and Acceleration? 2M

e. Name the three types of instantaneous centres for a mechanism 2M

2. In a four bar chain ABCD, AD is fixed and is 150 mm long. The crank AB is 40 mm long and rotates at 120 r.p.m. clockwise, while the link CD = 80 mm oscillates about D. BC and AD are of equal length. Find the angular velocity of link CD when angle BAD = 60°. 10M

3. In Fig. 7.9, 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 mm; AB = 44 mm; BC 49 mm; and BD = 46 mm. The center 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 10M

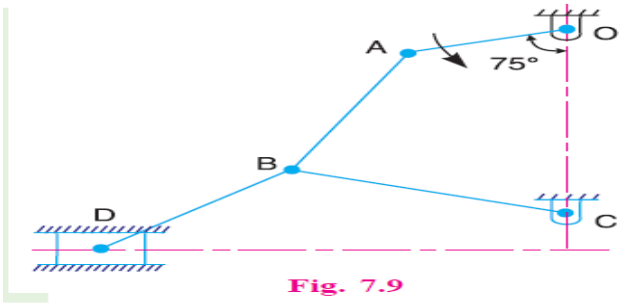


Fig. 7.9

4. The dimensions of the mechanism, as shown in Fig. 7.30, are as follows: AB = 0.45 m; BD = 1.5 m: BC = CE = 0.9 m. The crank AB turns uniformly at 180 r.p.m. in the clockwise direction and the blocks at D and E are working in frictionless guides. Draw the velocity diagram for the mechanism and find the velocities of the sliders D and E in their guides. Also determine the turning moment at A if a force of 500 N acts on D in the direction of arrow X and a force of 750 N acts on E in the direction of arrow Y. 10M

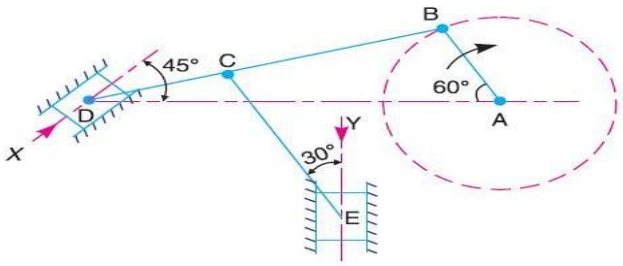


Fig. 7.30

5. a. Explain how the velocities of a slider and the connecting rod are obtained in a slider crank mechanism. 5M

b. Define rubbing velocity at a pin joint. What will be the rubbing velocity at pin joint when the two links move in the same and opposite directions? 5M

6. a. What are the various methods used for finding out acceleration of mechanism? Explain one of them. 5M

b. How the Velocity of a Point on a Link can find by Relative Velocity Method 5M

7. An engine mechanism is shown in Fig. 8.5. The crank CB = 100 mm and the connecting rod BA = 300 mm with centre of gravity G, 100 mm from B. In the position shown, the crankshaft has a speed of 75 rad/s and an angular acceleration of 1200 rad/s2. Find: 1. Velocity of G and angular velocity of AB, and 2. acceleration of G and angular acceleration of AB 10M

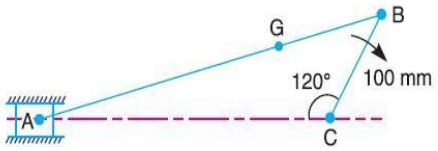


Fig. 8.5

8. Locate all the instantaneous centres of the slider crank mechanism as shown in Fig. 6.12. The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find: 1. Velocity of the slider A, and 2. Angular velocity of the connecting rod AB. 10M

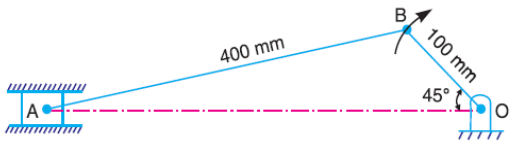


Fig. 6.12

9. a. What do you understand by the instantaneous centre of rotation in kinematic of machines? Answer briefly. 5M

b. Explain the following terms: (a) Instantaneous center (b) Body center and space 5M

centrode (c) Axode

10. **a.** Explain with sketch the instantaneous centre method for determination of velocities of links and mechanisms 5M

b. Discuss the three types of instantaneous centres for a mechanism 5M

UNIT - IV

1. **a.** Compare the performance of knife-edge, roller followers. 2M

b. What is a pressure angle of cam? 2M

c. Name the classifications of follower. 2M

d. Write the classifications of cams. 2M

e. What is under cutting? 2M

2. Use the following data in drawing the profile of a cam in which a knife-edged follower is raised with uniform acceleration and deceleration and is lowered with simple harmonic motion: Least radius of cam = 60 mm, Lift of follower = 42 mm, Angle of ascent = 60° Angle of dwell between ascent and descent = 40°, Angle of descent = 72°. If the cam rotates at 180 rpm, determine the maximum velocity and acceleration during ascent and descent. 10M

3. A cam is to give the following motion to a knife-edged follower : 10M

1. Outstroke during 60° of cam rotation;
2. Dwell for the next 30° of cam rotation;
3. Return stroke during next 60° of cam rotation, and
4. Dwell for the remaining 210° of cam rotation.

The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower is offset by 20 mm from the axis of the cam shaft.

4. A cam is to be designed for a knife edge follower with the following data: 10M

1. Cam lift = 40 mm during 90° of cam rotation with simple harmonic motion.
2. Dwell for the next 30°.
3. During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion.
4. Dwell during the remaining 180°.

Draw the profile of the cam when the line of stroke of the follower passes through the axis of the cam shaft.

The radius of the base circle of the cam is 40 mm. Determine the maximum velocity and acceleration of the follower during its ascent and descent, if the cam rotates at 240 r.p.m.

5. **a.** Explain with sketches the different types of followers. 5M

b. Write short notes on cams 5M

6. What are the different types of motion with which a follower can move? 10M

7. **1.** Define the following terms 10M

(i). Cam (ii). Follower (iii) Offset follower

(iv) Radial follower (v) Mushroom follower

8. A cam, with a minimum radius of 50 mm, rotating clockwise at a uniform speed, is required to give a knife edge follower the motion as described below : 10M

1. To move outwards through 40 mm during 108° rotation of the cam;
2. To dwell for next 70°;
3. To return to its starting position during next 72°, and 4. To dwell for the rest period of a revolution i.e. 110°.

Draw the profile of the cam, When the line of stroke of the follower is off-set by 15 mm right side of the cam axis.

The displacement of the follower is to take place with uniform acceleration and uniform retardation. Determine the maximum velocity and acceleration of the follower when the cam shaft rotates at 900 r.p.m.

9. A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below : 10M

1. To raise the valve through 50 mm during 120° rotation of the cam;
2. To keep the valve fully raised through next 30°;
3. To lower the valve during next 60°; and
4. To keep the valve closed during rest of the revolution i.e. 150°;

The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm.

Draw the profile of the cam when the line of stroke of the valve rod passes through the axis of the cam shaft.

The displacement of the valve, while being raised and lowered, is to take place with simple harmonic motion. Determine the maximum acceleration of the valve rod when the cam shaft rotates at 100 r.p.m.

10. A cam operating a knife-edged follower has the following data: a) Follower moves outwards through 40 mm during 60° of cam rotation. b) Follower dwells for the next 45°. c) Follower returns to its original position during next 90°. (d) Follower 10M

dwells for the rest of the rotation. The displacement of the follower is to take place with simple harmonic motion during both the outward and return strokes. The least radius of the cam is 50 mm. Draw the profile of the cam when the axis of the follower passes through the cam axis. If the cam rotates at 300 r.p.m., determine maximum velocity and acceleration of the follower during the outward stroke and the return stroke

UNIT – V

1.	**a.**	Explain the terms :(i) Module, (ii) Addendum	2M
	b.	State the law of gearing.	2M
	c.	What is a reverted gear train? Where is it used?	2M
	d.	What is a differential gear?	2M
	e.	What is the application of bevel gear?	2M
2.	**a.**	What do you understand by the term 'interference' as applied to gears?	5M
	b.	Write advantages and disadvantages of gears	5M
3.		Explain the classification of gears with neat sketches	10M
4.		Explain the epicycloids and hypocycloidal forms of teeth with neat sketch	10M
5.		The number of teeth on each of the two equal spur gears in mesh is 40. The teeth have 20° in volute profile and the module is 6 mm. If the arc of contact is 1.75 times the circular pitch, find the addendum.	10M
6.		In a reverted epicyclic gear train, the arm A carries two gears B and C and a compound gear D - E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes	10M

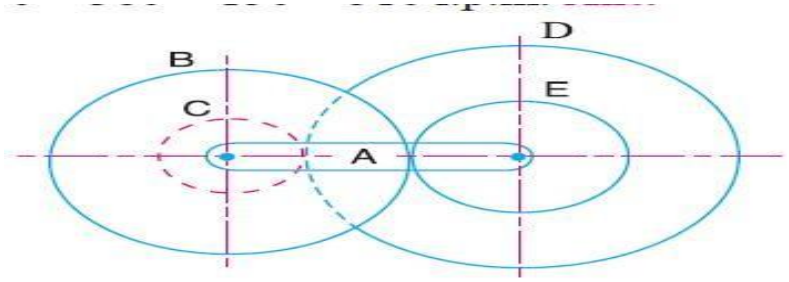


Fig. 13.8

100 r.p.m. clockwise.

7.		An epicyclic gear consists of three gears A, B and C as shown in Fig. 13.10.The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the center of A at 18 r.p.m.. If the gear A is fixed, determine the speed of gears B and C	10M

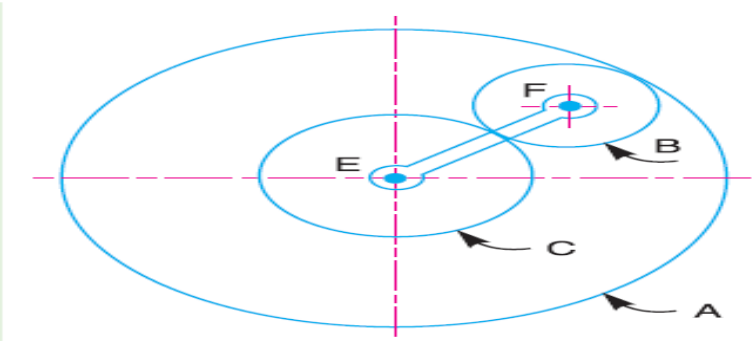


Fig. 13.10

8. In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m. In the anticlockwise direction about the center of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed makes 300 r.p.m. in the clockwise direction, what will be the speed of gear B? 10M

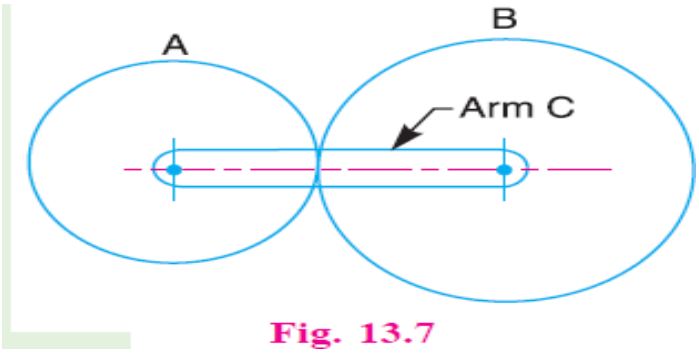


Fig. 13.7

9. **a.** What do you understand by 'gear train'? Discuss the various types of gear trains. 5M

b. How the velocity ratio of epicyclic gear train is obtained by tabular method? 5M

10. Explain briefly the differences between simple, compound, and epicyclic gear trains. What are the special advantages of epicyclic gear trains? 10M