

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV • EXAMINATION – SUMMER 2013****Subject Code: 143401****Date: 07-06-2013****Subject Name: Machines and Mechanisms****Time: 10:30am – 01:00pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain the term kinematic link. Give the classification of kinematic pair. **07**
 (b) Sketch and explain the various inversions of a slider crank chain. **07**
- Q.2** (a) What is the condition for correct steering ? Sketch and show the two main types of steering gears and discuss their relative advantages. **07**
 (b) Explain Geneva mechanism with diagram? What are applications? **07**

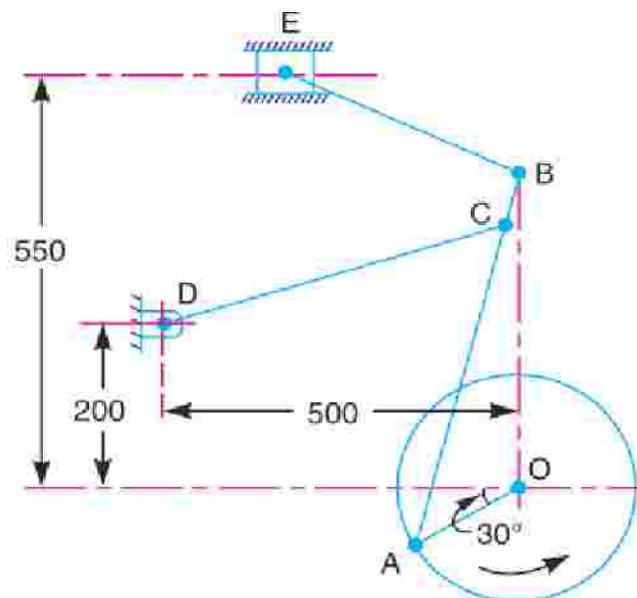
OR

- (b) Figure shows the mechanism of a radial valve gear. The crank OA turns uniformly at 150 r.p.m and is pinned at A to rod AB. The point C in the rod is guided in the circular path with D as centre and DC as radius. The dimensions of various links are: **07**

OA = 150 mm ; AB = 550 mm ; BE = 350 mm.

AC = 450 mm ; DC = 500 mm ;

Determine velocity and acceleration of the ram E for the given position of the mechanism.



All dimensions in mm.

- Q.3** (a) Explain with sketches the different types of cams and followers. **07**

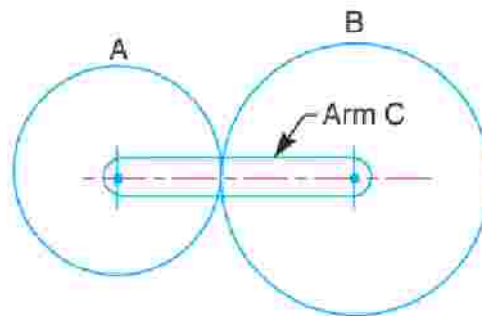
- (b) A cam operating a knife-edged follower has the following data : 07
- Follower moves outwards through 40 mm during 60° of cam rotation.
 - Follower dwells for the next 45° .
 - Follower returns to its original position during next 90° .
 - Follower dwells for the rest of the rotation.
- The displacement 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, and
 - the axis of the follower is offset 20 mm towards right from 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.

OR

- Q.3** (a) Define the following terms as applied to cam with a neat sketch :- 07
- Base circle, (b) Pitch circle,
 - Pressure angle, and (d) Stroke of the follower.
- (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 : 07
- Follower to have a stroke of 20 mm during 120° of cam rotation ;
 - Follower to dwell for 30° of cam rotation ;
 - Follower to return to its initial position during 120° of cam rotation ; and
 - Follower to dwell for remaining 90° 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.
- Q.4** (a) Explain the following : 07
- Law of gearing, (ii) Angle of friction, and
 - Coefficient of friction, (iv) Gyroscopic effect in ship
- (b) A load of 10 kN is raised by means of a screw jack, having a square threaded screw of 12 mm pitch and of mean diameter 50 mm. If a force of 100 N is applied at the end of a lever to raise the load, what should be the length of the lever used? Take coefficient of friction = 0.15. What is the mechanical advantage obtained? State whether the screw is self locking. 07

OR

- Q.4** (a) 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 ? 07



- (b) The number of teeth in gears 1 and 2 are 60 and 40 ; module = 3 mm ; pressure angle = 20° and addendum = 0.318 of the circular pitch. Determine the velocity of sliding when the contact is at the tip of the teeth of gear 2 and the gear 2 rotates at 800 r.p.m. **07**
- Q.5 (a)** What is the function of a flywheel? How does it differ from that of a governor? What is Coefficient of Fluctuation of Speed **07**
- (b)** Write a short note on primary and secondary balancing? What are in-line engines ? How are they balanced ? **07**
- OR**
- Q.5 (a)** Explain : **07**
1. D' Alembert's Principle,
 2. Super position Principle
- (b)** A single cylinder engine runs at 250 r.p.m. and has a crank of 180 mm. The reciprocating parts has a mass of 120 kg and the revolving parts are equivalent to a mass of 70 kg at a radius of 90 mm. A mass is placed opposite to the crank at a radius of 150 mm to balance the whole of the revolving mass and two-thirds of the reciprocating mass. Determine the magnitude of the balancing mass and the resultant residual unbalance force when the crank has turned 30° from the inner dead centre, neglect the obliquity of the connecting rod. **07**
