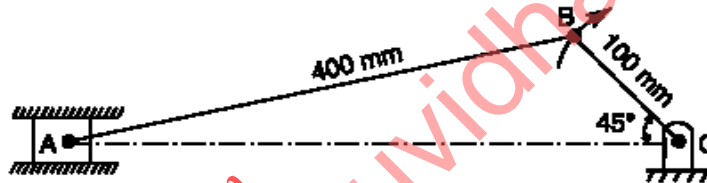


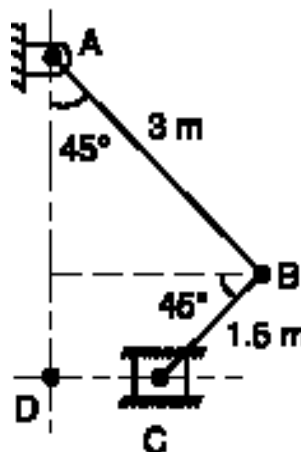
GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV • EXAMINATION – WINTER 2013****Subject Code: 141902****Date: 26-12-2013****Subject Name: Kinematics of Machines****Time: 02:30 pm to 05:00 pm****Total Marks: 70****Instructions:**

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

- Q.1** (a) Describe briefly Types of Constrained Motions **07**
 (b) Sketch and explain any two inversions of double slider crank chain **07**
- Q.2** (a) Explain Types of Instantaneous Centres and also state Aronhold Kennedy (or Three Centres in Line) Theorem **05**
 (b) Locate all the instantaneous centres of the slider crank mechanism as shown in Fig.1. The lengths of crank OB and connecting rod AB are 100mm 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. **09**

**Fig No.1****OR**

- (b) In the mechanism shown in Fig. 2, the slider C is moving to the right with a velocity of 1 m/s and an acceleration of 2.5 m/s². The dimensions of various links are AB = 3 m inclined at 45° with the vertical and BC = 1.5 m inclined at 45° with the horizontal. Determine: 1. The magnitude of vertical and horizontal component of the acceleration of the point B, and 2. the angular acceleration of the links AB and BC. **09**

**Fig No.2**

- Q.3 (a)** What are straight line mechanisms? Describe one type of exact straight line motion mechanism with the help of a sketch. **07**
- (b)** Sketch and show the Davis steering mechanism and discuss their advantages and disadvantages. **07**
- OR**
- Q.3 (a)** State and prove the law of gearing **07**
- (b)** Explain any five terminology of gear tooth with neat sketch. **07**
- Q.4 (a)** The mean diameter of the screw jack having pitch of 10mm is 50mm. A load of 20000N is lifted through a distance of 170mm. Find the work done in lifting the load and efficiency of the screw jack when
1. The load rotates with the screw, and
 2. The load rests on the loose head which does not rotate with the screw.
- The external and internal diameter of the bearing surface of the loose head are 60mm and 10mm respectively. The co-efficient of friction for the screw as well as the bearing surface may be taken as 0.08.
- (b)** A single plate clutch, effective on both sides, is required to transmit 25kW at 3000R.P.M. Determine the outer and inner radii of frictional surface if the coefficient of friction is 0.255, the ratio of radii is 1.25 and the maximum pressure is not to exceed 0.1 N/mm². Also determine the axial thrust to be provided by springs. Assume the theory of Uniform Wear. **07**
- OR**
- Q.4 (a)** A pulley is driven by a flat belt, the angle of lap being 120°. The belt is 100mm wide by 6mm thick and density 1000kg/m³. If the coefficient of friction is 0.3 and the maximum stress in the belt is not to exceed 2MPa, find the greatest power which the belt can transmit and the corresponding speed of the belt. **07**
- (b)** 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 100 R.P.M. clockwise. **07**
- Q.5 (a)** Explain with a neat sketch the “Differential Gear Box” **05**
- (b)** A cam is to be designed for a knife edge follower with the following data: **09**
1. Cam lift = 40mm 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 uniform velocity.
 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 40mm.
- OR**
- Q.5 (a)** Derive an expression for the length of the path of contact in a pair of meshed spur gears. **07**
- (b)** Explain with sketches the different types of cams and followers. **07**
