Seat No: _____ Enrollment No: _____

# PARUL UNIVERSITY

## FACULTY OF ENGINEERING & TECHNOLOGY

### B.Tech. Winter 2019 - 20 Examination

**Semester: 3** **Date: 06/12/2019**
**Subject Code: 203101209/03101209** **Time: 02:00pm to 04:30pm**
**Subject Name: Analysis of Mechanism and Machine Elements** **Total Marks: 60**

**Instructions:**
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

**Q.1 Objective Type Questions** **(15)**

**1.** A link which does not undergo any deformation while transmitting motion is called as _____ link.

**2.** When the motion between the elements, forming a pair,is such that the constrained motion is not completed by itself, but by some other means, then the motion is said to be _____ constrained motion.

**3.** Write Kutzbach equation to calculate movability of a planar mechanism.

**4.** Pendulum pump is obtained by fixing _____ of a single slider crank chain.

**5.** In a 4 bar linkage, if the lengths of shortest, longest and the other two links are denoted by s, l, p and q, then it would result in Grashof's linkage if _____.

**6.** The locus of the instantaneous centre in space during a definite motion of the body is called as _____ .

**7.** When the two links have a pure rolling contact then the instantaneous centre lies on _____.

**8.** The algebraic sum of the angular velocities of the two links which are connected by pin joints, multiplied by the radius of the pin is called as _____.

**9.** Radial component of acceleration acts _____ to the link.

**10.** Write Unwin's formula for the relation between diameter of rivet hole and thickness of plate.

**11.** A line joining the centres of rivets and parallel to the edge of the plate is known as _____ .

**12.** In _____ process, the end of the plate is pressed by a round-nosed chisel to obtain a leak proof joint.

**13.** The parallel fillet welded joint is designed for _____ strength.

**14.** For a shaft subjected to combined bending moment (M) and twisting moment (T), the equivalent twisting moment is _____ .

**15.** The centre to centre distance between two consecutive rivets in a row, is called _____.

**Q.2 Answer the following questions. (Attempt any three)** **(15)**

**A)** Explain Beam engine and Oldham's coupling with a neat sketch.

**B)** Find the diameter of a solid steel shaft to transmit 20000 W at 200 r.p.m. The ultimate shear stress for the steel may be taken as 360 MPa and a factor of safety as 8. If a hollow shaft is to be used in place of the solid shaft, find the inside and outside diameter when the ratio of inside to outside diameters is 0.5.

**C)** Classify and explain in detail the types of kinematic pairs.

**D)** What do you understand by instantaneous centre of rotation? Explain types of instantaneous centres of rotation.

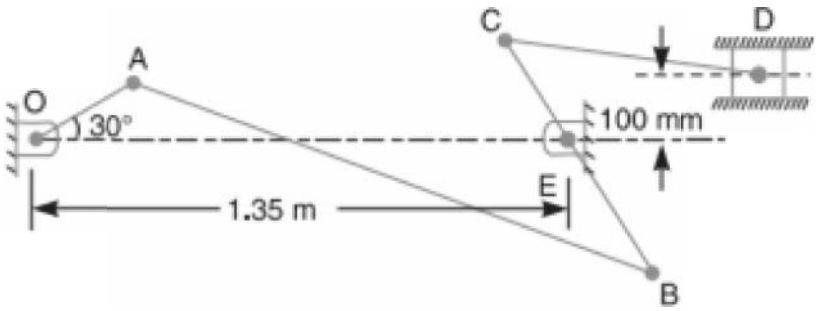
**Q.3 A)** In a crank and slotted lever quick return motion mechanism, the distance between the fixed centres is 240 mm and the length of the driving crank is 120 mm. Find the inclination of the slotted bar with the vertical in the extreme position and the time ratio of cutting stroke to the return stroke. If the length of the slotted bar is 450 mm, find the length of the stroke if the line of stroke passes through the extreme positions of the free end of the lever. **(07)**

**B)** Derive the expression for velocity and acceleration of a piston of an IC engine. **(08)**

**OR**

**B)** A mechanism, as shown in figure below, has the following dimensions: **(08)**

OA = 200 mm; AB = 1.5 m; BC = 600 mm; CD = 500 mm and BE = 400 mm.




1. Locate all the instantaneous centres.
2. If crank OA rotates uniformly at 120 r.p.m. clockwise, find angular velocity of the link AB and Velocity of slider D.

**Q.4** **A)** Explain butt joint, lap joint, corner joint, edge joint and tee joint with neat sketches. What are advantages of welded joints over riveted joints? **(07)**

**OR**

**A)** The crank of a slider crank mechanism rotates clockwise at a constant speed of 300 r.p.m. The crank is 150 mm and the connecting rod is 600 mm long. Determine : **(07)**

1. linear velocity and acceleration of the midpoint of the connecting rod, and
2. angular velocity and angular acceleration of the connecting rod, at a crank angle of 45° from inner dead centre position.

**B)** In a four bar mechanism shown below, torques $T_3$ and $T_4$ have magnitudes of 30 N.m and 20 N.m respectively. The link lengths are AD = 800 mm, AB = 300 mm, BC = 700 mm and CD = 400 mm. For the static equilibrium of the mechanism, determine the required input torque $T_2$ **(08)**