Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Summer 2018 - 19 Examination

Semester: 3 **Date: 31/05/2019**

Subject Code: 03101205 **Time: 02:00 pm to 04:30 pm**

Subject Name: Analysis of Mechanism & 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 - (Each of one mark) **(15)**

1. Transverse fillet welded joint is generally designed for _____ stress
2. Degree of freedom of a Screw pair is _____
3. Direction of linear velocity of a point on a rotating link and its tangential acceleration is _____
4. Rivet is used for Permanent fastening between plates. True or False?
5. Number of instantaneous centres for slider crank mechanism is _____
6. A circular solid rod of diameter d welded to a rigid flat plate by a circular fillet weld of throat thickness t is subjected to a twisting moment T. The maximum shear stress induced in the weld is
   a) $T / (\pi r^2 t)$ b) $T / (2 \pi r^2 t)$ c) $T / (4 \pi r^2 t)$ d) $2T / (\pi r^2 t)$
7. Which of the following is a turning pair ?
   (a) Piston and cylinder of a reciprocating steam engine
   (b) Shaft with collars at both ends fitted in a circular hole
   (c) Lead screw of a lathe with nut
   (d) Ball and socket joint
8. Which of the following is an inversion of double slider crank chain?
   (a) Hand pump (b) Scotch yoke mechanism
   (c) Elliptical trammels (d) Both (b) & (c)
9. 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 Grashoff's linkage provided that
   (a) $l + p < s + q$ (b) $l + s < p + q$
   (c) $l + p = s + q$ (d) none of these
10. The centre to centre distance between two consecutive rivets in a row is called as
    (a) Margin (b) Pitch
    (c) Back pitch (d) Diagonal pitch
11. Write the Grubler's criterion for determining the degrees of freedom (n) of a mechanism having plane motion is
12. Differentiate lower pair and higher pair.
13. Generally shaft is made of (Ductile / Brittle) material
14. Write magnitude of centripetal component of acceleration
15. Give two example of completely contrained motion

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

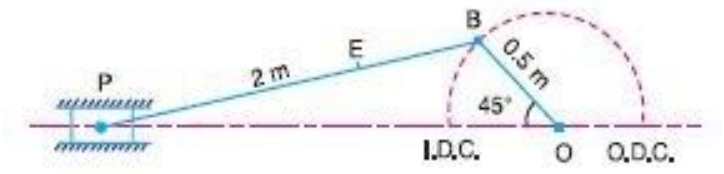
A) Enlist different inversions of Single slider crank chain? Explain any two

B) Define the following terms:
   (i) Rigid body (ii) Kinematic pair
   (iii) Kinematic chain (iv) Mechanism (v) Machine

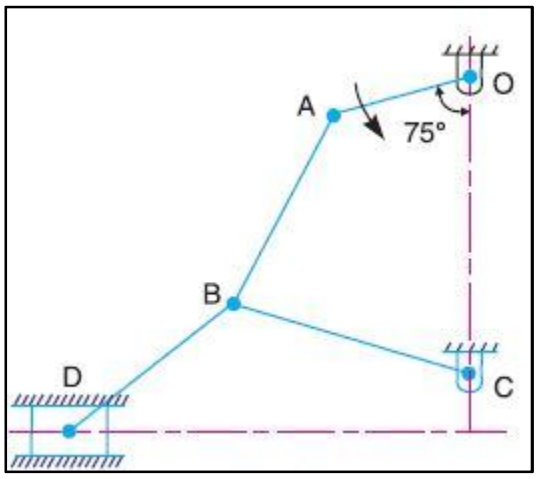
C) Explain and draw ICR method for four bar mechanism

D) State and explain D'Alembert's principle.

Q.3 A) The crank and connecting rod of a theoretical steam engine are 0.5 m and 2 m long respectively. The crank makes 180 r.p.m. in the clockwise direction. When it has turned 45° from the inner dead centre position, determine : 1. velocity of piston, 2. angular velocity of connecting rod, 3. velocity of point E on the connecting rod 1.5 m from the gudgeon pin **(07)**



B) In Figure, 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 Centre distance between the centers 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. **(08)**



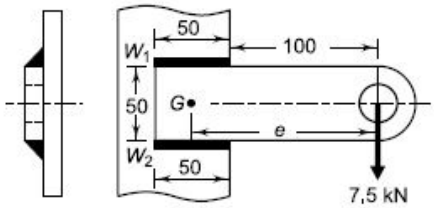
OR

B) In **Q.3 A)** if crank is rotating with constant angular velocity then find 1) Acceleration of piston 2) Angular acceleration of connecting rod **(08)**

Q.4 A) A double riveted double strap butt joint used to connect two plates, each plate of 12 mm thickness, by means of 16 mm diameter rivets having pitch of 48 mm. The rivets and plates are made of steel. The permissible stresses in tension, shear and compression are 80, 60 and 120 N/mm2 respectively. Determine the efficiency of the joint. **(07)**

OR

B) A welded connection, as shown in Fig. is subjected to an eccentric force of 7.5 KN. Determine the size of welds if the permissible shear stress for the weld is 100 N/mm^2 **(07)**



B) A propeller shaft is required to transmit 45 kW power at 500 rpm. It is a hollow shaft, having an inside diameter 0.6 times of outside diameter. It is made of plain carbon steel and the permissible shear stress is 84 N/mm^2. Calculate the inside and outside diameters of the shaft. **(08)**