Total No. of Questions—**8**] [Total No. of Printed Pages—**5**

Seat No.	

[5152]-116

S.E. (Mech./Mech. Sand./Auto.) (II Sem.) EXAMINATION, 2017

THEORY OF MACHINES—I

(2012 COURSE)

Time : Two Hours **Maximum Marks : 50**

***N.B.* :—** (*i*) Attempt Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4** Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Define 'Inversion'. Explain with the help of neat sketches any *two* inversions of Four bar chain. [5]

(*b*) Write a note on 'Dynamically Equivalent System'. [5]

Or

2. (*a*) State the principle for correct steering and obtain the geometrical condition for correct steering of a car. [5]

(*b*) With the help of neat schematic diagram, derive frequency equation of Trifilar suspension system. [5]

P.T.O.

3. (*a*) Determine the inner radius of friction plate of single plate clutch and force required to engage the clutch, for the following specifications : [5]

(*i*) Power transmission capacity = 25 kW

(*ii*) Speed = 900 rpm

(*iii*) Outer diameter of plate is 360 mm

(*iv*) Maximum intensity of pressure between the plates = 85 kN/m^2.

(*v*) Coefficient of friction = 0.25.

Consider both the sides of the plate are effective.

Assume uniform wear condition.

(*b*) Explain Complex Algebra Method of acceleration analysis for a binary link. [5]

Or

4. (*a*) Describe with neat sketch the construction and working of Torsion dynamometer. [5]

(*b*) Derive an equation for velocity of piston in an I.C. engine mechanism, when crank rotates with uniform angular velocity using analytical method. [5]

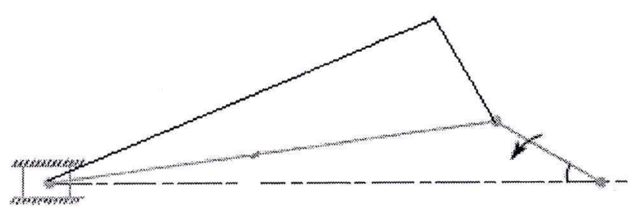
5. (*a*) State and explain 'three centre's inline theorem'. [4]

(*b*) In the mechanism shown in Fig. 1, the crank OA rotates at 180 rpm in anticlockwise direction and gives motion to the sliding blocks B and point D. For the given configuration of mechanism, determine by relative velocity method and relative acceleration method : [11]

(*i*) Velocity of point D and slider B point

(*ii*) Angular velocity of link ABD

(*iii*) Acceleration of sliders B.



OA = 300 mm , AB =1.3 m , AD = 500, BD = 1.2 m

Fig. 1

Or,

6. (*a*) With the help of neat sketch, explain the concept of 'Velocity Image Principle'. [4]

(*b*) In the mechanism shown in Fig. 1 the crank OA rotates at 180 rpm in anticlockwise direction and give motion to the sliding block B and point D. For the given configuration of mechanism, locate all instantaneous centers of rotation and determine : [11]

(*i*) Velocity of point D and slider B

(*ii*) Magnitude and direction of angular velocity of link ABD.

7. (*a*) What is Coriolis acceleration ? Find the direction of this acceleration in the case shown in Fig. 2 : [4]

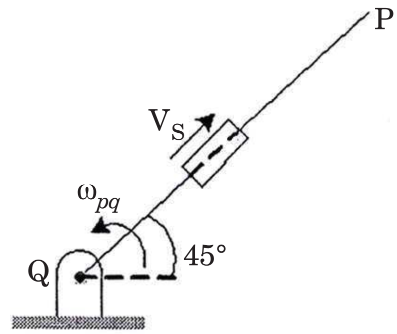


Fig. 2

(*b*) The crank of an engine is 200 mm long and obliquity ratio is 4. Determine the velocity and acceleration of the piston using Klein's construction, when the crank is turned through 40° from top dead centre position for the following two cases : [11]

(*i*) Crank rotates at a uniform speed of 300 rpm

(*ii*) Crank rotates at a speed of 300 rpm and is increasing at the rate of 120 rad/s^2.

Or

8. (*a*) Draw Klein's construction, and explain how to obtain velocity and acceleration of a piston in an I.C. engine mechanism, when crank rotates at a uniform angular velocity. [4]

(*b*) In the mechanism shown, link 4 moves to the left with a velocity of 80 mm/s and with acceleration is 80 mm/s^2 to the left. Draw the velocity and acceleration polygons and obtain angular velocity and angular acceleration of link 2. Link length AB = 50 mm, fixed link is link no. 1 : [11]

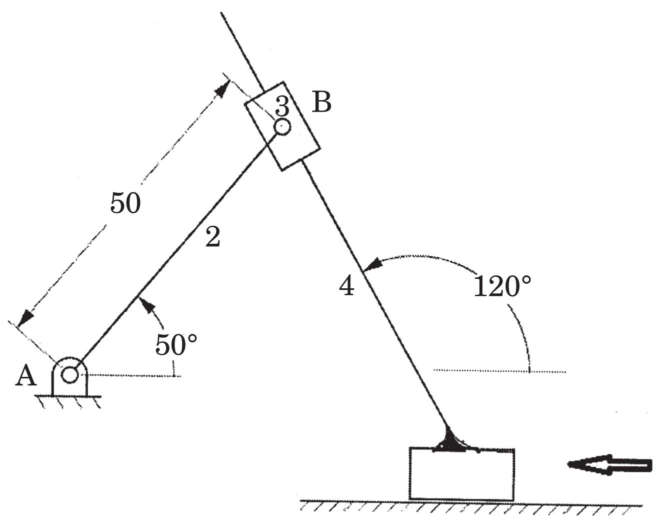


Fig. 3