Total No. of Questions—8] [Total No. of Printed Pages—4+1

Seat No.	

[4757]-1019

S.E. (Mech./Mech. Sand./Auto.) (Second Semester)

EXAMINATION, 2015

THEORY OF MACHINES—I

(2012 PATTERN)

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

N.B. :— (*i*) Answer 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 double slider crank chain. [5]

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

Or

2. (*a*) Compare 'Davis' and 'Ackermann' Steering Gear Mechanisms. [4]

(*b*) With the help of neat schematic diagram, derive frequency equation of bifilar suspension system. [6]

P.T.O.

3. (*a*) Determine the dimensions of the contact surfaces of cone clutch, for the following specifications : [5]

(*i*) Power transmission capacity = 20 kW

(*ii*) Speed = 1600 rpm

(*iii*) Cone angle = 30°

(*iv*) Maximum intensity of pressure = 0.8×10^5 N/m^2

(*v*) Coefficient of friction = 0.3

(*vi*) Mean radius is twice the width of the friction surface. 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 epicyclic train type 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]

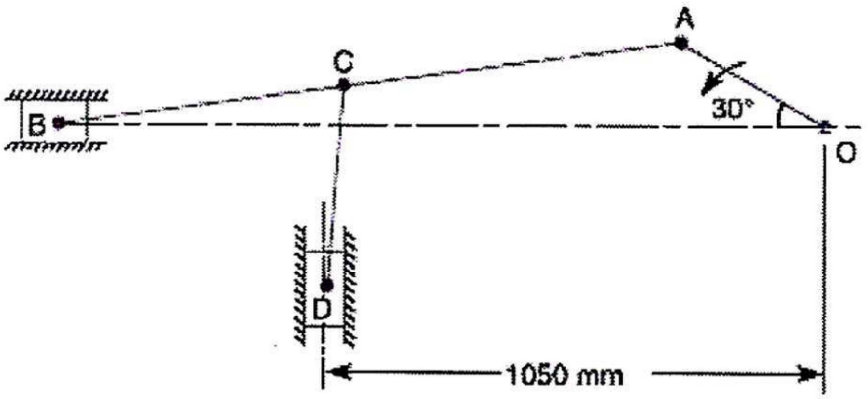
5. (*a*) State and explain Kennedy's theorem. [4]

(*b*) In the mechanism shown in Fig. 1, the crank OA rotates at 20 rpm in anticlockwise direction and gives motion to the sliding blocks B and D. For the given configuration of mechanism, determine by relative velocity method and relative acceleration method : [11]

(*i*) Velocity of sliders B and D

(*ii*) Angular velocity of link CD

(*iii*) Acceleration of sliders B.



OA = 300 mm, AB = 1.2 m, BC = CD = 450 mm

Fig. 1 (for Q. No. 5 (*b*) and Q. No. 6(*b*))

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 20 rpm in anticlockwise direction and gives motion to the sliding blocks B and D. For the given configuration of mechanism, locate all instantaneous centers of rotation, then determine :

(*i*) Velocity of sliders B and D

(*ii*) Angular velocities of links AB and CD. [11]

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

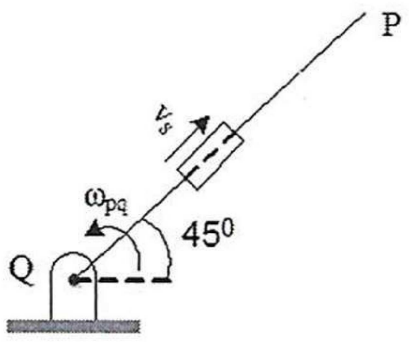


Fig. 2 (For Q. 7(a))

(*b*) The crank of an engine is 180 mm long and obliquity ratio is 4. Determine the velocity and acceleration of the piston, when the crank is turned through 40° from I.D.C. position for the following two cases : [11]

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

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

Or

8. (*a*) Explain the procedure to construct Kleins construction to determine the velocity and acceleration of a piston an I.C. engine mechanism, when crank rotates at a uniform angular velocity. [4]

(*b*) The driving crank AB of length 75 mm for the quick return mechanism, as shown in Fig. 3 revolves at a uniform speed of 200 rpm. Find acceleration of point Q, for the configuration shown, when the crank makes an angle of 60° with the vertical line of centers PA. [11]

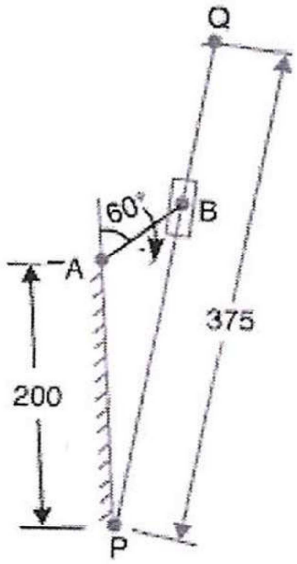


Fig. 3 (For Q. 8(b))