Total No. of Questions—**8**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4657]-519

S.E. (Mech./Mech. Sand./Auto.) (Second Sem.) EXAMINATION, 2014

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]

P.T.O.

(*b*) Find the dynamically equivalent two mass systems for a connecting rod when one third of the mass is located at the small end. Center of mass is at 2/3 length from the small end and its moment of inertia is 1/20 mL^2. [5]

Or

2. (*a*) Explain with neat sketch Davis steering gear mechanism. [5]

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

3. (*a*) Determine the time required to accelerate a countershaft of rotating mass 500 kg radius of gyration 200 mm to the full speed of 250 r.p.m. from rest through a single plate clutch of internal and external radii 125 mm and 200 mm, taking coefficient of friction as 0.3 and axial force of 600 N. Assume that only one side of clutch is effective. [5]

(*b*) Explain complex algebra method of acceleration analysis for a binary link. [5]

Or

4. (*a*) Explain differential band brake with neat sketch. State the condition for self-locking and self-energizing of brake. [5]

(*b*) Two shafts A and B are connected by a Hookes Joint and have their axes inclined at 20°. Find maximum acceleration of the shaft B and angular position of shaft when the speed of shaft is 1000 r.p.m. uniform. [5]

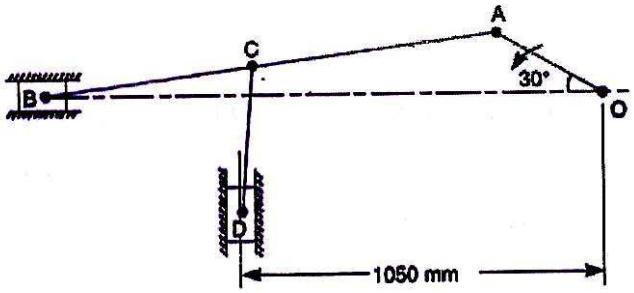
5. (*a*) Explain different types of instantaneous center of rotation. [4]

(*b*) In the mechanism shown in Fig. 1, the crank OA rotates at 20 r.p.m. 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

Or

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

(*b*) A mechanism as shown in Fig. 2 has the following dimensions : OA = 200 mm, AB = 1500 mm, BC = 600 mm, CD = 500 mm, BE = 400 mm. Locate the instantaneous centre. If crank OA rotates uniformly at 120 r.p.m., find velocity of B, D and C and the angular velocity of link AB, BC and CD. [11]

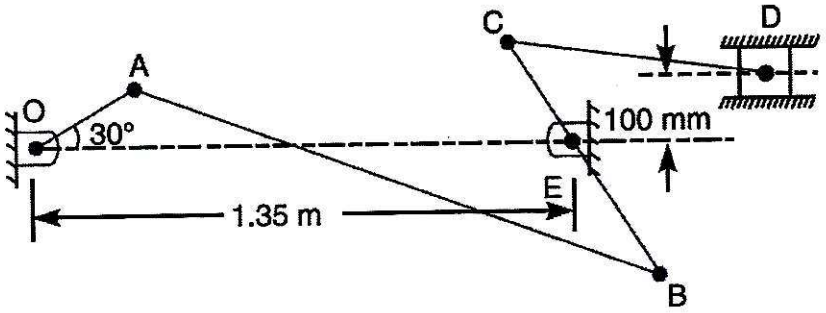


Fig. 2

7. (*a*) What is Coriolis acceleration ? Find the direction of this acceleration in the case shown in Fig. 3 : [4]

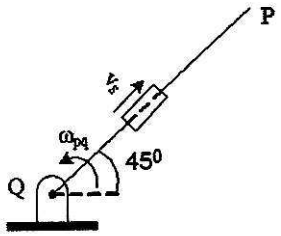


Fig. 3

(*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 :

(*i*) the crank rotates at a uniform speed of 300 r.p.m.

(*ii*) the crank rotates at a speed of 300 r.p.m. and is increasing at the rate of 120 rad/s^2. [11]

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. 4 revolves at a uniform speed of 200 r.p.m. 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]

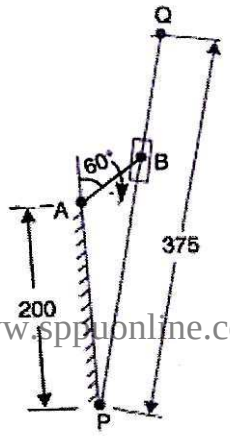


Fig. 4