Total No. of Questions—8] [Total No. of Printed Pages—6

Seat No.	

[5352]-116

S.E. (Mech./Mech. Sand/Auto) (II Sem.) EXAMINATION, 2018

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 Grashof's law and explain the effect of changing in length of links on inversion of four bar chain. [5]

(*b*) The connecting rod of a gasoline engine is 300 mm long between it centres. It has a mass of 15 kg and mass moment of inertia of 7000 kg-mm^2. Its centre of gravity is at 200 mm from its small end centre. Determine the dynamical equivalent two-mass system of the connecting rod if one of the masses is located at the small end centre. [5]

P.T.O.

Or

2. (*a*) Sketch and describe the working of crank and slotted lever mechanisms. Give examples of their applications. [5]

(*b*) Explain dynamically equivalent system and correction couple. [5]

3. (*a*) A multi-disc clutch has three discs on the driving shaft and two on the driven shaft. The outside diameter of the contact surfaces is 240 mm and inside diameter 120 mm. Assuming uniform wear and coefficient of friction as 0.3, find the maximum axial intensity of pressure between the discs for transmitting 25 kW at 1575 rpm. [5]

(*b*) In an I.C. Engine mechanism, the crank is 250 mm long and connecting rod is 800 mm long. The crank rotates at uniform speed of 800 rpm. When the piston has moved through 250 mm from TDC position. Calculate acceleration of piston and angular acceleration of connecting rod. [5]

Or

4. (*a*) Explain epicyclic gear train dynamometer with neat sketch and also explain how power measurement is done. [5]

(*b*) Two shafts with an included angle of 160° are connected by a Hooke's joint. The driving shaft runs at a uniform speed of 1500 rpm. Determine the angle turned through by the driving shaft when the velocity ratio is maximum and unity. [5]

Or

5. (*a*) The crank OA of a mechanism, as shown in Fig. 1, rotates clockwise at 120 rpm. The length of various links are : OA = 100 mm; AB = 500 mm; AC = 100 mm and CD = 750 mm. Line of action for slider D is horizontal. Find, by instantaneous centre method : 1. Velocity of point C; 2. Velocity of slider D; and 3. Angular velocities of the links AB and CD. [12]

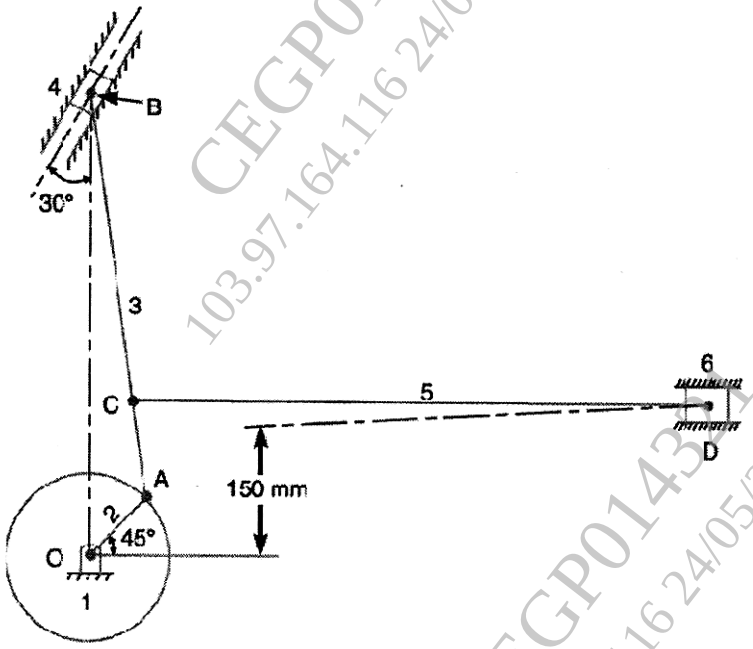

Fig. 1

(*b*) State and prove Kennedy's theorem of three centre in line. [3]

Or

6. (*a*) A mechanism as shown in Fig. 2 has the following dimensions; OA = 200 mm, AB = 1500 mm and BE = 400 mm. If crank OA rotates uniformly at 120 rpm, find the angular velocity and angular acceleration of link AB and BE. [12]

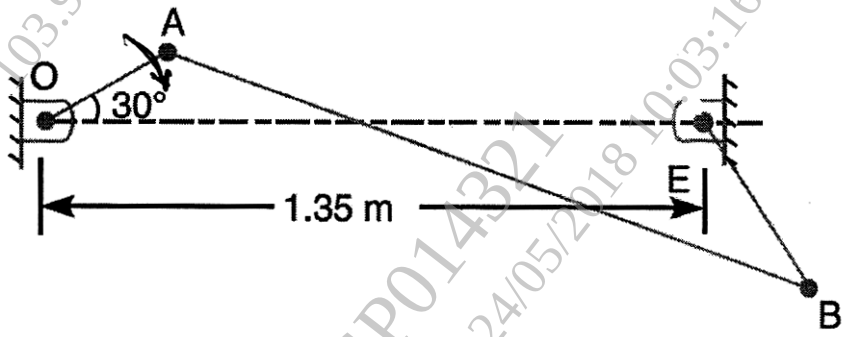

Fig. 2

(*b*) Derive an expression for tangential acceleration when the motion of particle is along circular path. [3]

7. (*a*) In a Whiteworth quick return motion, as shown in Fig. 3, OA is a crank rotating at 30 rpm in a clockwise direction. The dimensions of various links are : OA = 150 mm, OC = 100 mm. [12]

Determine the acceleration of point B on slotted lever and the angular acceleration of the slotted lever CA.

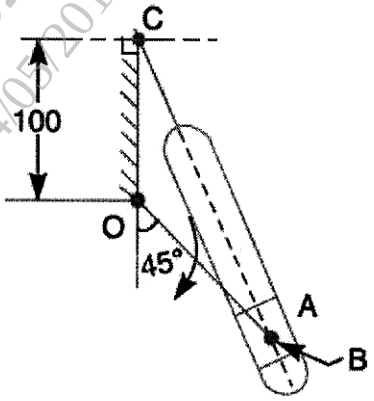

Fig. 3

(*b*) Give Klein's construction for determining the acceleration of piston of a reciprocating engine, when the crank is rotating with uniform velocity. [3]

Or

8. (*a*) The following data relate to a slider crank mechanism, crank radius = 300 mm, connecting rod length = 1500 mm, crankshaft speed = 180 rpm. By Klein's construction. Determine : [12]

(*i*) Velocity and acceleration of the mid-point of the connecting rod.

(*ii*) Angular velocity and angular acceleration of connecting rod and

(*iii*) Velocity of slider.

For the instants when the slider has Zero Acceleration.

(*b*) Explain the procedure to decide direction of Coriolis component of acceleration. [3]