Total No. of Questions—4] [Total No. of Printed Pages—4

Seat No.	

[5252]-116

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

THEORY OF MACHINES-I

(2012 PATTERN)

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

N.B. :— (*i*) Answer Q. **1** *or* Q. **2**, Q. **3** *or* Q. **4**, Q. **5** *or* Q. **6**, Q. **7** *or* Q. **8**.

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

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

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data whenever necessary.

1. (*a*) Explain working of Ackermann Steering gear mechanism. [5]

(*b*) A connecting rod is suspended from a point 30 mm above the small end and 600 mm above its CG. It makes 20 oscillations in 35 second. Find dynamically equivalent two mass when one mass is placed at small end center. Take mass of connecting rod as 30 kg. [5]

Or

2. (*a*) Explain T-θ diagram of a 4-stroke single cylinder engine. [5]

(*b*) Match the following : [5]

Column A	**Column B**
(*i*) Spherical Pair	(*i*) Peaucellier Mechanism
(*ii*) Four Revolute Pairs	(*ii*) Force and Motion
(*iii*) Completely Constrained Motion	(*iii*) Forces Only
(*iv*) Link of Structure	(*iv*) Planar Mechanism
(*v*) Straight Line Mechanism	(*v*) Shaft with Collar at Both End in a Round Hole

(*vi*) 3 DOF

3. (*a*) With the help of neat sketch explain working of internal expanding shoe brake [4]

(*b*) Two shafts are connected by a Hook's joint, angle between them is 25°. [6]

Find :

(*i*) Minimum and Maximum speed of driven shaft

(*ii*) Rotation angle of the driving shaft where speed of driving and driven shaft are same

Take rotational speed of driving shaft as 800 rpm.

Or

4. (*a*) A multi disc clutch transmits 60 kW of power at 1500 rpm. Axial intensity of pressure not to exceed 160 kN/m^2. The internal radius 80 mm and is 0.65 times the external radius. Find the number of plates needed to transmit the required torque.

Take coefficient of friction 0.1 [6]

(*b*) Write a loop closure equation for offset slider crank mechanism. [4]

5. (*a*) A mechanism is shown in Fig. 1, determine velocity of E of the bell crank lever by ICR method

O_1A = 100 mm, O_3C = 200 mm, O_2D = 200 mm, AC = 700 mm, O_2E = 400 mm.

BD = 150 mm, BC = 200 mm

Crank O_1A rotates at uniform speed of 100 rad/s. [12]

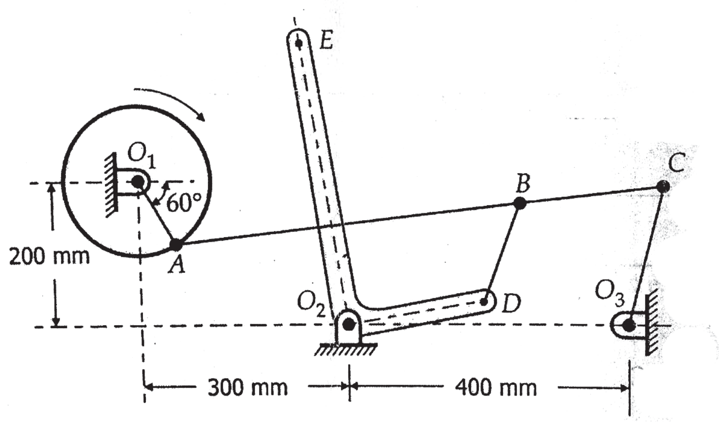

Fig. 1. (*a*)

(*b*) Explain velocity image principle. [3]

Or

6. In the mechanism shown in Fig. 2, the crank OA rotates uniformly at 5 rad/s. for the given configuration. Determine acceleration of slider D. Also determine angular acceleration of link AB and CD Various link lengths are :

Crank O_1A is 30 mm and makes angle of 45° with horizontal, AB = 65 mm, O_2B = 50 mm, O_2C = 50 mm, BC = 60 mm, CD = 85 mm, O_1O_2 = 65 mm. [15]

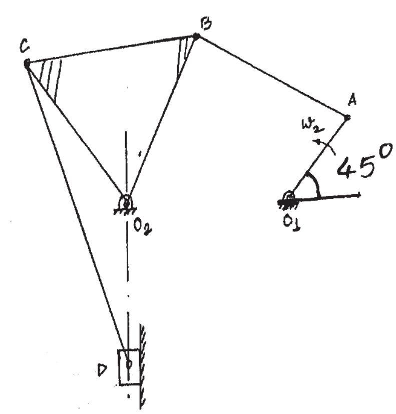

Fig. 2

7. In a Whitworth quick return motion mechanism shown in Fig. 3 OA rotates at 30 rpm in clockwise direction.

The dimensions of various links are :

OA = 150 mm, OC = 100 mm, CD = 125 mm and DR = 500 mm. Determine the acceleration of the sliding block R and the angular acceleration of the slotted lever CA. [15]

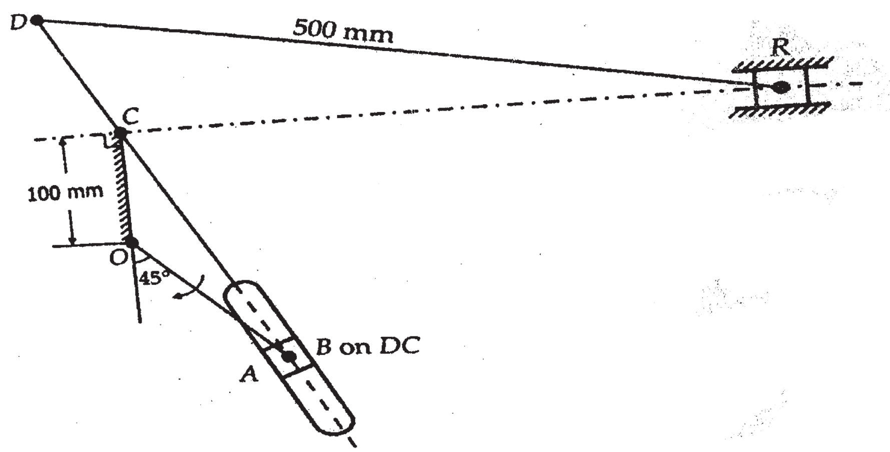

Fig. 3

Or

8. (*a*) In an 1C engine mechanism crank rotates at 250 rpm in clockwise direction. Length of the crank is 150 mm and obliquity ratio is 5. when the crank turned through 40° from IDC. Determine : [12]

(*i*) Velocity of Piston

(*ii*) Acceleration of the piston

(*iii*) Angular velocity and acceleration of connecting rod

(*iv*) If angular acceleration of the crank is 100 rad/s.

Use Klien's construction.

(*b*) Write a short note on Coriolis component of acceleration. [3]