B.TECH. SEM -IV MECHANICAL 2014 COURSE (CBCS) :
WINTER - 2017
SUBJECT : MECHANISMS OF MACHINES*

Day : **Monday** Time **02.30 PM TO 06.30 PM**
Date : **20/11/2017** **W-2017-2093** Max. Marks : 60

N.B.

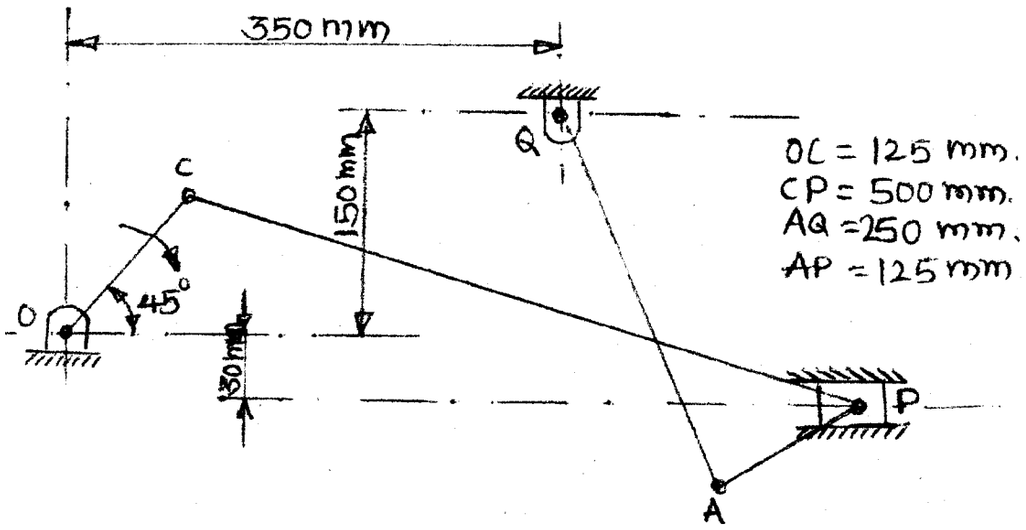
1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable **CALCULATOR** is allowed.
4) Assume suitable data if necessary.

Q.1 What is mean by inversion? Explain with neat sketches inversions of a double slider crank chain mechanism. **(10)**

OR

Q.1 State and prove the conditions of correct steering. Explain with neat sketch and derive Davis Steering gear mechanism. **(10)**

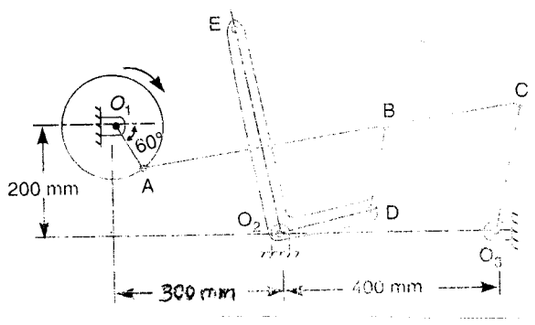
Q.2 In the mechanism shown in the following figures O and Q are fixed centers. If crank OC rotates at a uniform speed of 120 rpm in clockwise direction, find angular velocity of links CP, PA and AQ and linear velocity of slider P by instantaneous center method. **(10)**



OR

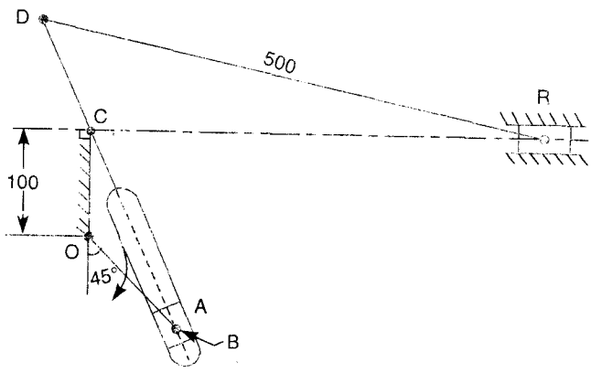
Q.2 Assuming following data: The mechanism of a warping machine, as shown in fig. below has the dimensions as follows: **(10)**
$O_1A = 100$ mm; AC = 700 mm; BC = 200 mm; BD = 150 mm; $O_2D = 200$ mm; $O_2E = 400$; $O_3C = 200$ mm.
The crank O_1A rotates at a uniform speed of 100 rad/sec for the given configuration, determine :

i) Linear velocity of the point E on the bell crank lever.
ii) Acceleration of the points E and B.
iii) Angular acceleration of the bell crank lever.



P.T.O.

Q.3 In a Whitworth quick return motion mechanism, as shown in figure, OA is a crank rotating at 30 r.p.m. in a 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. **(10)**



All dimensions in mm.

OR

Q.3 The crank of an engine is 200 mm long and the ratio of connecting rod length to the crank radius is 4. Determine the acceleration of the piston, the acceleration of a point X on the connecting rod (located at $3/4^{th}$ distance from small end) and the angular acceleration of the connecting rod. when the crank is turned through 45^0 from the i.d.c. position for the following two cases. **(10)**

i) When the crank rotates at a uniform speed of 240 rpm, clockwise.

ii) When the instantaneous speed of rotation of the crank is 240 rpm clockwise and is increasing at the rate of 100 rad/sec^2.

Use Klein's construction.

Q.4 A reciprocating engine has crank radius 60 mm and connecting rod length 240 mm. It runs at 1200 r.p.m. uniformly. find : **(10)**

i) Maximum velocity of piston and corresponding crank angles and

ii) Acceleration of the piston when the crank is at 120^0 past inner dead centre.

OR

Q.4 Two shafts are connected by means of a Hooke's joint. The angle between the shafts are 20^0. What will be angle turned by the driving shaft when : **(10)**

i) Velocity ratio is maximum, minimum and unity

ii) Acceleration of the driven shaft is maximum and zero.

Q.5 Synthesize a slider crank mechanism so that the displacement of the slider is proportional to the square of the crank rotation in the interval $45^0 \leq \theta \leq 135^0$. Use three precision points with Chebyshev's spacing. **(10)**

OR

Q.5 Explain synthesis of mechanism and also classify synthesis problem. **(10)**

Q.6 The connecting rod of an oil engine has mass 52.5 kg. Its length between the centres is 857 mm. The big end and small end diameters are 120 mm and 76 mm respectively. When it is suspended vertically on a knife edge through the small end it makes 100 oscillations in 181 seconds. With the knife edge through the big end it makes 100 oscillations in 166 seconds. Find the moment of inertia of the rod and the distance of its CG from the small end centre. **(10)**

OR

Q.6 The obliquity ratio of a vertically reciprocating engine is 4.5. The engine bore and stroke is 75 mm and 90 mm respectively. The mass of the reciprocating parts is 1.2 kg. The gas pressure intensity is 5.5 bar, when it has moved 50^0 from the i.d.c. on its power stroke. Determine : **(10)**

i) Piston effort **ii)** Net load on gudgeon pin and the crank pin

iii) Thrust in cylinder walls **iv)** Thrust on crank bearing.

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