B.TECH. SEM -IV MECHANICAL 2014 COURSE (CBCS) :
SUMMER - 2018
SUBJECT : MECHANISMS OF MACHINES*

Day : **Saturday** | **S-2018-2301** | Time : **10.00 AM TO 02.00 PM**
Date : **02/06/2018** | 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.

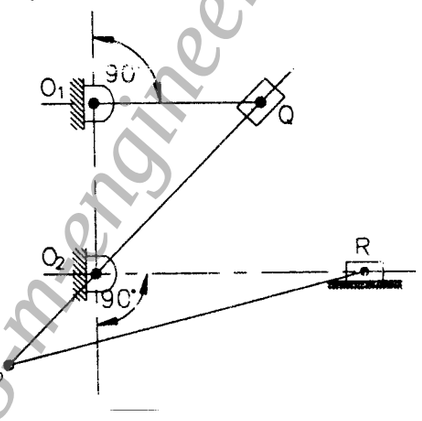
Q.1 Explain with neat sketches of Whitworth's quick return and crank and slotted lever quick return mechanism. **(10)**

OR

Q.1 Explain with neat sketches Pantograph mechanism and Gribler's criterion for planner mechanism. **(10)**

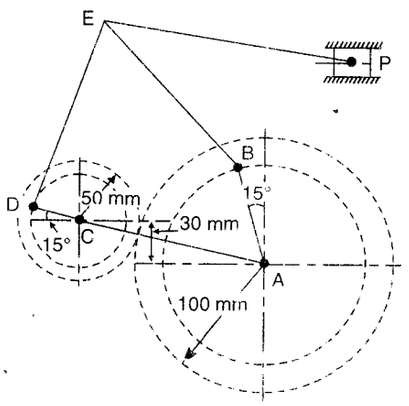
Q.2 Figure shows a quick return mechanism. Dimensions for this mechanism are : O_1O_2 = 150 mm O_1Q = 85 mm Q_2P = 75 mm PR = 405 mm
Angle $O_2O_1Q = 90^0$. The crank O_1Q rotates at 175 r.p.m. in counter clockwise direction. Using instantaneous centre method find : **(10)**

i) Velocity of the slider R and
ii) Angular velocity of the link PR.



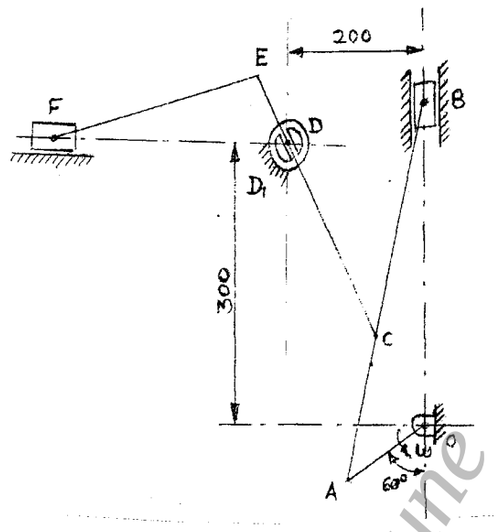
OR

Q.2 The dimensions of the Andreau differential stroke engine mechanism, as shown in figure are as follows : **(10)**
AB = 80 mm ; CD = 40 mm; BE = DE= 150mm; and EP = 200 mm.
The links AB and CD are geared together. The speed of the smaller wheel is 1140 r.p.m. Determine the velocity and acceleration of the piston P for the given configuration.



P.T.O.

Q.3 In the mechanism shown in figure the crank OA, 10 cm long rotates uniformly at 15 rad/sec counter clockwise. For the configuration shown find acceleration of slider F when the dimensions are; AB=400 mm, AC = 150 mm, CE = 350 mm and EF = 300 mm. **(10)**



OR

Q.3 The crank of a reciprocating engine is 225 mm long, the connecting rod is 900 mm long and rpm is 150. Find the velocity and acceleration of the piston and the angular velocity and angular acceleration of the connecting rod when the angle which the crank makes with i.d.c. is **i)** 30^0 **ii)** 120^0. Use Klein's construction. **(10)**

Q.4 An I.C. engine runs at 2000 rpm. The length of the connecting rod is 270 mm and crank radius is 60 mm. Determine at 30% of out-stroke. Find **i)** Angular position of the crank **ii)** Linear velocity of piston **iii)** Linear acceleration of piston **iv)** Angular velocity of connecting rod **v)** Angular acceleration of connecting rod **vi)** crank angle for maximum piston velocity **vii)** maximum piston velocity **viii)** Crank angle for zero acceleration of piston. **(10)**

OR

Q.4 A Hooke's joint connects two shafts axes out of line by 25^0. The driving shaft runs at uniform speed of 150 rpm. The driven shaft has attached a mass of 200 kg at radius of gyration 150 mm. If a steady torque of 500 N-m resists the rotation of the driven shaft, calculate the torque required at driving shaft when $\theta = 45^0$, and maximum angular acceleration of the driven shaft. **(10)**

Q.5 Synthesize a four-bar linkage that will, in one of its positions, satisfy the following values for the angular velocities and accelerations: **(10)**

$y = x^{1.2}$ for $1 \le x \le 5$.

Using Chebyshev spacing for three precision points. Take $\phi_0 = 30^0, \psi_0 = 60^0$ and $\Delta\phi = \Delta\psi = 90^0$ and $r_1 = 10\,cm$.

OR

Q.5 Derive the expressions for displacement, velocity and acceleration of a four bar mechanism, in synthesis of mechanism. **(10)**

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Q.6 A connecting rod has a mass of 3 kg. It need 40 seconds for 50 oscillations when suspended from the small end and 35 seconds when suspended from the big end. The distance between the points of suspension is 200 mm. Find the moment of inertia of connecting rod and the position of centre of gravity from the small end. **(10)**

OR

Q.6 A small connecting rod 220 mm long between centres has a mass of 2 kg and moment of inertia of $2\times10^4\, kg\, mm^2$ about its centre of gravity. Centre of gravity is located at a distance of 150 mm from the small end centre. Determine the dynamically two mass system when one mass is located at the small end centre.
If the connecting rod is replaced by two masses located at the two centres, find the correction couple that must be applied for complete dynamical equivalence of the system, when the angular acceleration of the connecting rod is 20000 rad/s^2 clockwise. **(10)**

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