Total No. of Questions : 8]

SEAT No. :

P602

[Total No. of Pages : 3

[5869]-217

S.E. (Mechanical / Automation & Robotics)

KINEMATICS OF MACHINERY

(202047) (2019 Pattern) (Semester - IV)

Time : 2½ Hours] *[Max. Marks : 70*

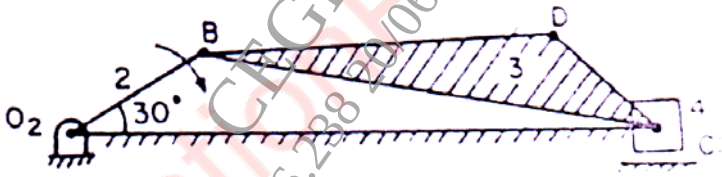
Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain with neat sketch different type of ICR. **[5]**

b) For the mechanism as shown in fig. find the acceleration of point D on link DBC when link O_2B rotates at 30 r/s. Using relative velocity and acceleration method. **[13]**

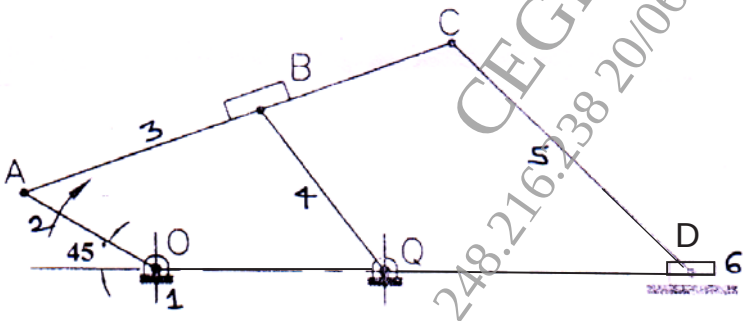
O_2B = 200mm, BD = 430mm, DC = 170mm, BC = 570mm.



OR

Q2) a) Explain Velocity Image Principle with neat sketch. **[5]**

b) For the configuration shown in the following fig. enumerate and locate all the instantaneous centers of velocities and hence, find the velocity of slider D, if the link OA rotates at 1000 rpm. Link lengths are OQ = 225 mm, QB = 200 mm, AB = 250 mm, OA = 150 mm, AC = 450 mm, CD = 325 mm. Total no. of links are 6. **[13]**



P.T.O.

Q3) a) Explain 3 position relative pole method for synthesis of four bar chain mechanism. **[5]**

b) A four-bar mechanism is to be synthesized by using precision points to generate the function $y = 2x^2 - x$ for the range $1 \leq x \leq 4$. Assuming 30º starting position and 120º finishing position for input link and; 70º starting and 160º finishing position for output link. Find out values of x, y, θ (input angles) and φ (output angles) corresponding to the 3 precision points with Chebyshev spacing. **[12]**

OR

Q4) a) Explain the following terms : **[6]**

i) Dimensional Synthesis

ii) Function generation

iii) Body guidance

b) Determine the chebyshev spacing for function $y = x^{1.3}$ for the range $0 \leq X \leq 3$ where three precision points are required. For these precision points, determine θ_1, θ_2, θ_3 & ϕ_1, ϕ_2, ϕ_3 if $\Delta\theta = 40º$ & $\Delta\phi = 90º$. **[11]**

Q5) a) What is a law of gearing? Explain the importance of law of gearing. **[5]**

b) Two involute gears of 20° pressure angle are in mesh. The number of teeth on pinion is 20 and the gear ratio is 2. If the pitch expressed in module is 5 mm and the pitch line speed is 1.2 m/s, assuming addendum as standard and equal to one module. find : **[13]**

i) The angle turned through by pinion when one pair of teeth is in mesh; and

ii) The maximum velocity of sliding.

OR

Q6) a) State and explain terminology for spur gear with neat sketch. **[6]**

b) The following data relate to a pair of 20° involute gears in mesh: **[12]**

Module = 6 mm, Number of teeth on pinion = 17, Number of teeth on gear = 49; Addenda on pinion and gear wheel = 1 module.

Find :

i) The number of pairs of teeth in contact;

ii) The angle turned through by the pinion and the gear wheel when one pair of teeth is in contact, and

iii) The ratio of sliding to rolling motion when the tip of a tooth on the larger wheel (i) is just making contact, (ii) is just leaving contact with its mating tooth, and (iii) is at the pitch point.

Q7) a) Define the concept of automated production lines with suitable example. **[5]**

b) A cam is to give the following motion to a knife-edged follower : **[12]**

i) Outstroke during 60° of cam rotation;

ii) Dwell for the next 30° of cam rotation:

iii) Return stroke during next 60° of cam rotation, and

iv) Dwell for the remaining 210° of cam rotation.

The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower passes through the axis of the cam shaft.

OR

Q8) a) Short note : Automation and Al's Role in Manufacturing Industry. **[5]**

b) The following data related to a cam profile, in which the follower moves with S.H.M. during the lift and returning it with uniform acceleration and retardation, retardation being half the acceleration. **[12]**

i) Minimum radius of cam, r_b = 30 mm.

ii) Lift of follower, S = 45 mm.

iii) Radius of roller, r = 10 mm.

iv) Offset of follower axis, e =12 mm

v) Angle of ascent, θ_0 = 70° (Nature is S.H.M.).

vi) Outer dwell angle, θ_d = 45°.

vii) Angle of return, θ_r = 120° (uniform acceleration and retardation) Draw the cam profile.

⌘⌘⌘