Total No. of Questions : 8]

SEAT No. :

PF4825

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S.E. (Mechanical)/(Automobile & Mechanical Engg.)/(Mechanical Sandwich)/(Automation & Robotics Engg.)

KINEMATICS OF MACHINERY

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

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q. 4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data if necessary.***

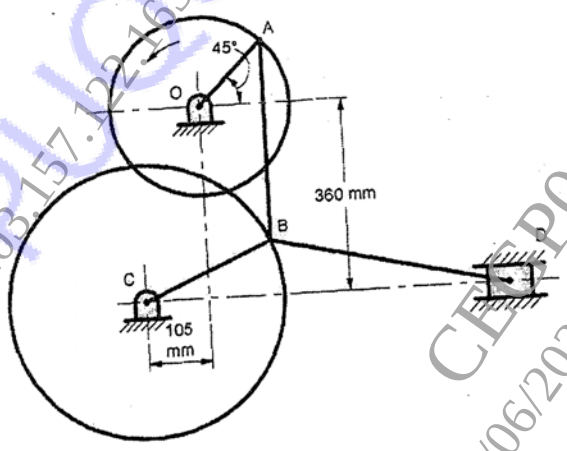
Q1) a) Explain with the help of neat sketch velocity image principle. **[7]**

b) The mechanism as shown in fig. the slider D constrained to move on a horizontal path. The crank OA is rotating in the counter- clockwise direction at a speed of 180 rpm. The dimensions of various links are as follows : OA = 180 mm, CB = 240 mm, AB = 360 mm, BD = 540 mm. For the given configuration. **[10]**

Find

i) Velocity of slider D,

ii) Angular velocity of link AB, CB and BD by relative velocity method.



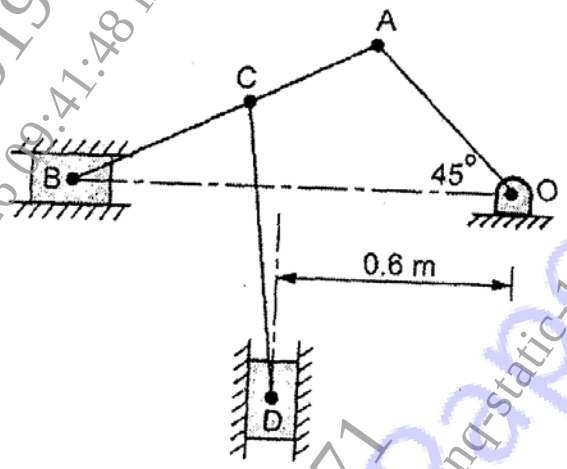
OR

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Q2) a) State and explain different types of ICRs **[7]**

b) The length of various links of a mechanism as shown in fig. OA = 0.3 m, AB = 1 m, CD = 0.8 m, AC = CB. Determine for the given configuration, The velocity of the slider D, if the crank OA rotates at 60 rpm in clockwise direction. Also find the angular velocity of the link CD. Use ICR Method. **[10]**



Q3) a) Explain the following terms **[9]**

i) Type synthesis

ii) Number Synthesis

iii) Dimensional Synthesis

b) Determine 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 and $ø_1$, $ø_2$, $ø_3$ if $\Delta\Theta$ = 40 degree and Aø = 90 degree. **[9]**

OR

Q4) a) Explain the following terms **[9]**

i) Path Generation

ii) Motion Generation

iii) Function Generation

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b) Design a four bar mechanism to generate the function $y = \sin x$, x varies from 0 to 90 degree. Angle of input link varies form 30 degree to 150 degree and angle of output link varies from 60 degree to 120 degree. Assume length for fixed link as one unit. Use three precision positions from chebyshev spacing. **[9]**

Q5) a) Explain the phenomenon of interference and undercutting in spur gear. **[8]**

b) Two 20 degree involute spur gears with module 8 mm are in mesh. Addena are equal to 1 module. Teeth on gear and pinion are 57 and 23 respectively. Find **[9]**

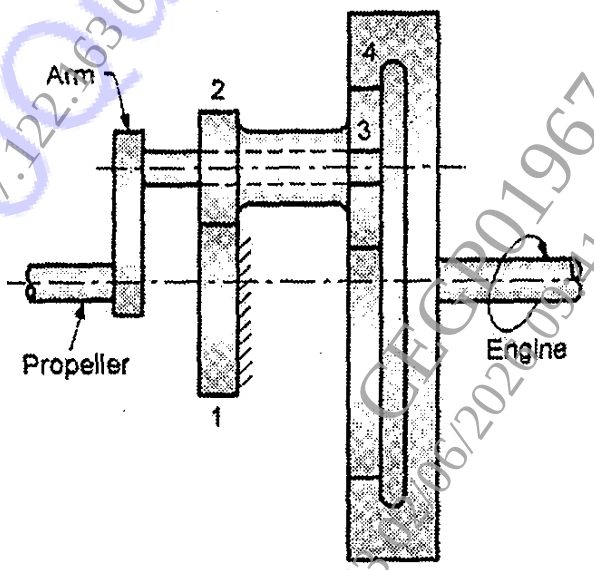
i) Number of pairs of teeth in contact.

ii) The angle of action of pinion and the gear wheel.

OR

Q6) a) Derive an expression for efficiency of worm and worm gears when the worm is driver. **[8]**

b) A aircraft engine drives a propeller through reduction drive as shown in fig. The gears 1, 2, 3 and 4 have 48, 27, 45, 120 teeth respectively. Find the propeller speed in magnitude and direction if engine makes 2500 rpm. **[9]**



Q7) a) What is the cam jump phenomenon? How it can be minimizing? **[8]**

b) A cam rotating clockwise at uniform speed of 100 rpm is required to give a motion to knife edge follower. The motions of the followers are described below, **[10]**

i) To move outward through 25 mm during 120 degree rotation of the cam

ii) To dwell for next 60 degree

iii) To return to its starting position during next 90 degree rotation of the cam

iv) To dwell for the rest period of the revolution

The minimum radius of the cam is 50 mm and the line of stroke of the follower passes through the axis of the cam shaft. If the displacement of the follower takes place with uniform acceleration and retardation on the both outward and return strokes. Draw the cam profile satisfying above motion.

OR

Q8) a) Write short note on assembly line balancing & buffer storage. **[8]**

b) Explain different types of transfer mechanisms. **[10]**

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