Register Number:……..

KUMARAGURU
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B.E/B.TECH DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Fourth Semester

MECHANICAL ENGINEERING

U18MET4003: Kinematics of Machinery

COURSE OUTCOMES

CO1: Apply the fundamental concepts in developing various mechanisms.
CO2: Analyze velocity and acceleration in planar mechanisms.
CO3: Synthesize simple mechanisms such as 4-bar and slider crank mechanisms.
CO4: Construct the cam profile for specific follower motion.
CO5: Determine appropriate gears for requirements.
CO6: Compute the parameters in gear trains and determine the speeds in gear boxes.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	State Aronhold Kennedy's theorem.	CO1	[K_1]
2.	List the applications of Inversions of Single Slider Crank Chain.	CO2	[K_1]
3.	Define function generation in synthesis of mechanism.	CO3	[K_1]
4.	Define relative pole in the graphical method of synthesis of mechanism.	CO3	[K_1]
5.	List the types of motion of the cam follower.	CO4	[K_1]
6.	Define the term pressure angle in radial cams.	CO4	[K_1]
7.	Define the terms addendum and dedendum in geared tooth profiles.	CO5	[K_1]
8.	Define Law of gearing.	CO5	[K_1]
9.	List the types of gear train.	CO6	[K_1]
10.	Define speed ratio and train value of gear train.	CO6	[K_1]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	Locate all the instantaneous centres of the slider crank mechanism as shown in Figure 1. The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find: 1. Velocity of the slider A, and 2. Angular velocity of the connecting rod AB.	CO1	[K_3]

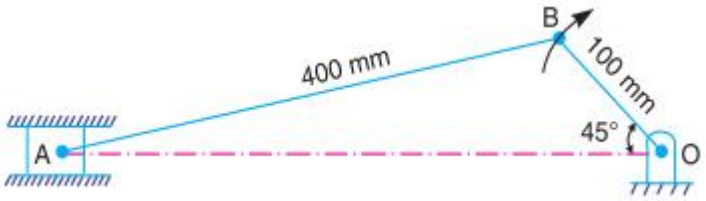

Figure 1

12. The dimensions and configuration of the four bar mechanism, shown in Figure 2, are as follows : P1A = 300 mm; P2B = 360 mm; AB = 360 mm, and P1P2 = 600 mm. The angle AP1P2 = 60°. The crank P1A has an angular velocity of 10 rad/s and an angular acceleration of 30 rad/s2, both clockwise. Determine the angular velocities and angular accelerations of P2B, and AB and the velocity and acceleration of the joint B CO2 [K3]

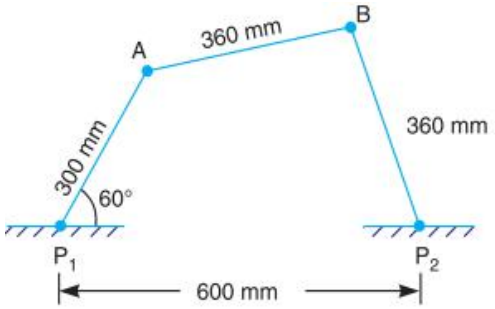

Figure 2

13. Design a four-bar link mechanism if the motions of the input and the output links are governed by a function y=x1.5 and x varies from 1 to 4. Assume θ to vary from 300 to 1200 and φ from 600 to 1300. The length of the fixed link is 30mm. Use Chebychev spacing of accuracy points. CO3 [K3]

14. Design a cam for operating the exhaust valve of an oil engine. It is required to give equal uniform acceleration and retardation during opening and closing of the valve each of which corresponds to 60° of cam rotation. The valve must remain in the fully open position for 20° of cam rotation. The lift of the valve is 37.5 mm and the least radius of the cam is 40 mm. The follower is provided with a roller of radius 20 mm and its line of stroke passes through the axis of the cam. CO4 [K3]

15. The following data relate to a pair of 20° involute gears in mesh: Module = 6 mm, Number of teeth on pinion = 17, Number of teeth on gear = 49, Addenda on pinion and gear wheel = 1 module. Find : CO5 [K3]

1. The number of pairs of teeth in contact

2. The angle turned through by the pinion and the gear wheel when one pair of teeth is in contact

3. 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.

16. An epicyclic train of gears is arranged as shown in Figure 3. How many revolutions does the arm, to which the pinions B and C are attached, make: 1. when A makes one revolution clockwise and D makes half a revolution anticlockwise, and 2. when A makes one revolution clockwise and D is stationary ? The number of teeth on the gears A and D are 40 and 90 respectively. CO6 [K3]

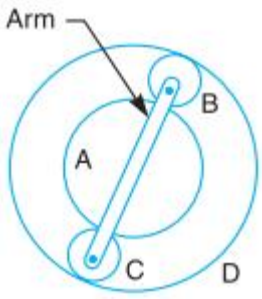

Figure 3

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