K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:III
Class:SY	Program:B.Tech
Branch Code:MEC	Pattern:2023
Name of Course:Mechanism and Machines	Course Code:2305203
Max. Marks:60	Duration:2.30 Hrs.

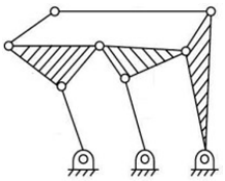
Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 03 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

Marks CO

Question No. 1

1a) Figure shows a schematic of a mechanism. Redraw the sketch. Find out the total number of kinematic links and kinematic pairs. Hence find out the degrees of freedom for the mechanism. (6) CO1



Question No. 2

2a) In a slider crank mechanism, the stroke of the slider is 200 mm and obliquity ratio is 4. The crank and connecting rod are mutually perpendicular to each other. The crank rotates uniformly at 240 rpm clockwise direction. Find i) linear velocity and linear acceleration of piston and ii) angular velocity and angular acceleration of the connecting rod. (6) CO2

Question No. 3

3a) Write short notes (6) CO3

i) Structural Error and Mechanical Error

ii) Task of Kinematic Synthesis

OR

3b) A four-bar mechanism is to be synthesised by using three precision points to generate the function $y = x^{1.5}$ for the range $1 \leq x \leq 4$. Input link is to start from 30˚ and is to have a range of 90˚. The output (6) CO3

link is to start at 0˚ and is to have a range of 90˚. Find out value of *x*, y, θ and φ corresponding to the three precision points.

3c) Determine the Chebychev spacing for function y = 5sin*x*. Where, x varies from 0˚ to 90˚. Angle of the driving link from 30˚ and 150˚, angle of driven link from 60˚ and 120˚. Length of fixed link is 10 cm. Determine the length of other links and draw the synthesised mechanism for second position. (10) CO3

OR

3d) Design a four-bar mechanism with input link l_2, coupler link l_3, and output link l_4. Angles of θ and φ for three successive positions are given in table below: (10) CO3

Position	1	2	2
θ	40˚	55˚	70˚
φ	50˚	60˚	75˚

If the grounded link l_1 = 30 mm, using Freudenstein's equation find out lengths of other links to satisfy the given positional conditions. Also draw the synthesised mechanism in its first position.

Question No. 4

4a) Write short notes on: (6) CO4

i) Inverted gear train ii) Compound gear train

OR

4b) Define the terms used in gears : (6) CO4

i) Module ii) Working depth iii) Circular pitch iv) Pressure angle

4c) Following data value to two meshing involute gears: (10) CO4

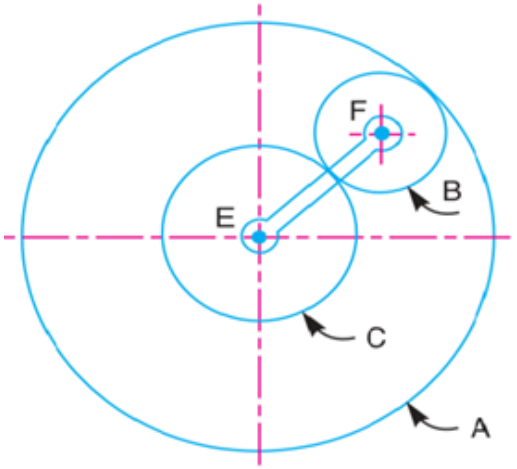
No of teeth on the gear wheel = 60, Pressure angle = 20°, Gear ratio = 1.5, Speed of the gear wheel = 100 rpm, Module = 8 mm

The addendum of each wheel is such that the path of approach and the path of recess on each side are 40% of the maximum possible length each.

Determine the addendum for the pinion and the gear and the length of arc of contact

OR

4d) An epicyclic gear train consists of three gears A, B & C as shown fig. The internal gear A has 72 teeth and gear C has 32 teeth. The gear B meshes with both gear A and C and is carried on an arm EF which rotates about the centre of A at 18 rpm. If the gear A is fixed, determine the speed of gears B & C. (10) CO4



Question No. 5

5a)	Classify the various types of cam.	(6)	CO5

OR

5b)	Draw for displacement, velocity and acceleration diagram when the follower moves with SHM motion.	(6)	CO5

5c)	A cam is to give the following motion to a knife edge follower: To raise the follower through 30mm with uniform acceleration and deceleration during 120° rotation of cam, Dwell for next 30° to lower the follower with SHM during next 90° rotation of cam. Dwell for rest of cam rotation. Use following data to draw the cam profile. Minimum radius of cam 30 mm, Speed 800 rpm clockwise. Also draw displacement, velocity and acceleration diagrams for the motion of follower in one complete rotation given to the cam, indicating the main values.	(10)	CO5

OR

5d)	Draw the profile of a cam operating reciprocating roller follower and with the following data: Minimum radius of cam 25 mm, lift = 40 mm, Roller diameter = 14 mm. The cam lifts the follower for 120° with SHM followed by dwell period of 90°. Then the follower lowers down during 90° of cam rotation with uniform acceleration and retardation followed by dwell period. If the cam rotates at a uniform speed of 150 rpm, calculate the maximum velocity and acceleration during outstroke and return stroke.	(10)	CO5

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