



**K. K. Wagh Institute of Engineering Education & Research, Nashik**  
(An Autonomous Institute From A.Y. 2022-23)

In-Sem Examination-II Summer2025	
Exam Seat No.:	
Academic Year:2024-2025	Semester:IV
Class: SY	Program:B.Tech
Branch Code:ROB	Pattern:2023
Name of Course:Design of Machines and Mechanism	Course Code:2312213
Max. Marks:30	Duration:1:15 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 2 pages.
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**

- 1 a) i) Explain Machine Design Process in brief . (4 marks) (7) CO1
- ii) A four-bar linkage has been designed with the following specifications:  
Input angle =  $40^\circ$   
Length of Input link = 40 mm  
Length of Coupler link = 0.06 m  
Length of Output link = 7 cm  
Length of Fixed link = 80 mm  
Find the values of coupler angle and output angle using any method. (3 marks)

**Question No. 2**

- 2 a) i) Define the following terms: (8) CO2
- a) Factor of Safety
  - b) Degrees of Freedom
  - c) Under-constrained mechanism
  - d) Over-constrained mechanism (4 marks)
- ii) The crank and connecting rod of a theoretical steam engine are 2 m and 8 m long respectively. The crank makes 150 rpm in the clockwise direction. When it has turned  $60^\circ$  from the inner dead centre position, determine the velocity of piston using graphical method. (4 marks)

**OR**

- 2 b) i) What are the design considerations and constraints in the design of a machine or mechanism. (8) CO2  
(4 marks)
- ii) Given the following specifications of a slider-crank mechanism:  
Input angle =  $55^\circ$   
Length of Input link = 21.08 mm  
Length of Coupler link = 56.6 mm  
Calculate: Position of Slider and Piston Displacement using analytical method. (4 marks)

**Question No. 3**

- 3 a) i) What is a reverted gear train? Explain with figure. (4 marks) (7) CO3
- ii) Define the following terms with respect to gears:
- a) Pitch circle
  - b) Circular pitch
  - c) Module (3 marks)

**Question No. 4**

- 4 a) What is the difference between simple gear train and compound gear train? Explain with figures. (8) CO3
- A compound train consists of six gears. The number of teeth on the gears A, B, C, D, E, F are 70, 50, 60, 30, 36, 30 respectively. The gears B and C are on one shaft while the gears D and E are on another shaft. The gear A drives gear B, gear C drives gear D and gear E drives gear F. The motor shaft is connected to gear A and rotates at 950 r.p.m. What is the speed of gear F ? (8 marks)

**OR**

- 4 b) Explain the terms 'synthesis' and 'function generation'. (8) CO3
- Determine the three precision positions of input and output angles for a mechanism to generate a function  $y = x^{1.3}$  when  $x$  varies from 1 to 5 using Chebyshev's spacing. Assume that the initial values for the input and output link are  $30^\circ$  and  $90^\circ$  respectively and the difference between the final and initial values for the input and output links are each equal to  $90^\circ$ . (8 marks)

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