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

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

InSem Examination-I Winter2025	
Exam Seat No.:	
Academic Year: 2025-2026	Semester: I
Class: FY	Program:B.Tech
Branch Code: FYE	Pattern: 2023
Name of Course: Fundamentals of Mechanical Engineering	Course Code: 2300114A
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 two 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)	A steel rod of 3 m length and diameter 35 mm is subjected to a tensile force of 60 kN. If the modulus of elasticity is 2.1 x 10^5 N/mm^2, find: a) Change in length b) % Elongation c) % reduction in cross sectional area if the final diameter is 22 mm.	(7)	CO4
Question No. 2			
2 a)	Compare Spur gear, Helical gear, Bevel gear and Worm gear with respect to orientation of one shaft with respect to the other.	(4)	CO5
2 b)	Sketch a helical gear pair and write an equation to estimate Gear Ratio (i) in the context of given parameters Speed, No. of teeth, Pitch circle diameter and Torque acting on the spur pair of gear and pinion.	(4)	CO5
	Group OR		
2 c)	Illustrate with a labelled diagram how an internal expanding shoe brake works. Suggest the material to be used as friction linings for this brake.	(4)	CO5
2 d)	Sketch a centrifugal clutch and explain how engine speed controls its engagement and disengagement with a real life example.	(4)	CO5
Question No. 3			
3 a)	A Carnot cycle heat engine operates between source and sink temperature of 227^0C and 27^0C. If the heat engine receives 42 kJ of heat from the source. Calculate a) Carnot efficiency b) Work done c) Heat Rejected	(7)	CO3
Question No. 4			
4 a)	State: i)) The law that governs transfer of heat from a body at lower temperature to a body at higher temperature ii)) Newton's law of cooling	(4)	CO3
4 b)	A heat engine receives 4000 J of heat from a high temperature reservoir and rejects 1600 J to the surroundings. Apply the Kelvin Planck statement to explain why the engine cannot have 100 % efficiency, and calculate its actual efficiency.	(4)	CO3

Group OR

4 c)	Prove that $COP_{HP} = COP_R + 1$	(4)	CO3
4 d)	For each of the following situations, identify the primary mode of heat transfer and justify your answer. i) Touching a hot cup of tea ii) Boiling water in a pot iii) Feeling the warmth of the sun on your skin	(4)	CO3

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