



	InSem Examination-II Summer2024		
	Exam Seat No.:		
	Academic Year:2023-2024	Semester: IV	
	Name of Programme: S. Y. B.Tech (R&A)	Pattern:2022	
	Name of Course: Design of Machine Elements	Course Code:ROB222012	
	Max. Marks:30	Duration:1 hour	

	<p>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.</p> <ol style="list-style-type: none">1. This question paper contains 2 pages2. 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.	
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Question No. 1 Attempt following Question

- a) i) What is strain? (7) CO1, CO2

A steel bar with an original length of 6 m undergoes deformation when a force of 9000 N is applied to it. The deformed length of the bar is 6.2 m. Calculate the strain experienced by the steel bar in percentage. [3 marks]

- ii) Explain the basic procedure of machine design. [4 marks]

OR

- b) i) What is volumetric strain? (7) CO1, CO2

A gas in a sealed container has an initial volume of 450cm^3 . When the pressure is increased, the volume expands to 480cm^3 . Calculate the volumetric strain experienced by the gas. [3 Marks]

- ii) Explain Hooke's law. What are elastic limit and ultimate stress in a stress-strain curve for mild steel? [4 marks]

- c) i) What are the basic types of stress that act on the body? Explain with figures. [4 marks] (8) CO1, CO2
- ii) A composite rod is 1400 mm long; its two ends are 60 mm² and 50mm² in area and length are 600 mm and 500 mm respectively. The middle portion of the rod is 40mm² in area and 300 mm long. If the rod is subjected to an axial tensile load of 2000 N, find its total elongation. (E = 200 GPa). [4 marks]

OR

- d) i) What is eccentric loading? Explain with figure. (8) CO1, CO2
- Write down Bending Moment equation and explain each term in it. [4 marks]
- ii) A beam with a length of 5 m is subjected to an eccentric load of 750 N. The distance between the applied force and the center of the beam is 0.5 m. Determine the moment applied to the beam and find the maximum bending stress if the beam has a rectangular cross-section with a width of 0.2 m and a height of 0.4 m. [4 marks]

Question No. 2 Attempt following Question

- a) i) What are flat belts? What are their advantages and limitations? [3 marks] (7) CO3
- ii) A pulley used to transmit power by means of ropes has a diameter of 5 m; the angle of groove is 45°; angle of lap is 170° and the coefficient of friction between the ropes and the groove sides are 0.28. The tension in the tight side of the rope is 850 N and the speed of the pulley is 85 rpm. Find the power transmitted per rope. [4 marks]

OR

- b) i) Explain any one of the belt tensioning methods for small package conveyor. [3 marks] (7) CO3
- ii) In a flat drive, the distance between the centers of two pulleys is 250 cm. Diameters of larger and smaller pulleys are 60 cm and 40 cm respectively. Calculate the length of the flat belt needed for the open belt drive and cross belt drive system. [4 marks]
- c) i) What is power rating of a belt? What are the factors affecting power rating of belts? [4 marks] (8) CO3
- ii) Explain the difference between flat belts, V belts and Timing belts. [4 marks]

OR

- d) i) Explain the concept of slip and creep in a belt. [4 marks] (8) CO3
- ii) The power transmitted by a belt running over a pulley of 600 mm diameter at 400 rpm is 15 kW. If the tension on the tight side of the belt is 1400 N, what must be the tension on the slack side? [4 marks]

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