

QUESTION BANK

TITLE OF COURSE: DESIGN OF MACHINE ELEMENT

COURSE CODE: 23ME502

REGULATION: NR23

Course Objectives:

- 1.To understand the general design procedures and principles in the design of machine elements.
- 2.To study different materials of construction and their properties and factors determining the selection of material for various applications.
- 3.To determine stresses under different loading conditions.
- 4.To learn the design procedure of different fasteners, joints, shafts and couplings.

Course Outcomes:

CO1: The student acquires the knowledge about the principles of design, material selection, component behavior subjected to loads, and criteria of failure.

CO2: Understands the concepts of principal stresses, stress concentration in machine members and fatigue loading.

CO3: Design on the basis of strength and rigidity and analyze the stresses and strains induced in a machine element.

CO4: Design and analyze machine joints and power transmission elements.

CO5: Evaluate stresses, select suitable dimensions, and ensure safe mechanical performance of shafts.

**NRCM**

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8. Unit Wise Question Bank

Unit-I

S.No	Questions	BT	CO
Part – A (Short Answer Questions)			
1	Why the metals in their pure form un suitable for industrial use?	L1	CO1
2	Define (a) Toughness (b) Hardness and (c) Creep.	L2	CO1
3	List the main advantages of forged components.	L1	CO1
4	What are fits, tolerance and allowance?	L1	CO1
5	A reciprocating steam engine connecting rod is subjected to a maximum load of 65kN. Find the diameter of the connecting rod at its thinnest part if the permissible tensile stress is 35 N/mm ² .	L3	CO1
6	Derive an expression for the impact stress induced due to a falling load.	L2	CO1
7	Write short note on maximum shear stress theory.	L1	CO1
8	State assumptions made in deriving a bending formulary.	L1	CO1
9	What types of stresses are induced in shafts?	L1	CO1
10	What do you mean by factor of safety?	L1	CO1
Part – B (Long Answer Questions)			
11	a) Write short note on maximum shear stress theory verses maximum strain energy theory.	L2	CO1
	b) An unknown weight falls through 10mm on a collar rigidly attached to the lower end of a vertical bar 3m long and 600mm ² in section. If the maximum instantaneous extension is known to be 2mm, what are the corresponding stress and the value of un known weight? Take E=200kN/mm ² .	L3	CO1
12	a) Explain briefly the various theories of failures.	L2	CO1
	b) A beam of uniform rectangular cross-section is fixed at one end and carries an electric motor weighing 400 N at a distance of 300mm from the fixed end. The maximum bending stress in the beam is 40MPa. Find the width and depth of the beam, if depth is twice that of width.	L3	CO1
13	a) A cast iron pulley transmits 10 kW at 400 r.p.m. The diameter of the pulley is 1.2 meter and it has four straight arms of elliptical cross-section, in which the major axis is twice the minor axis. Determine the dimensions of the arm if the allowable bending stress is 15MPa	L3	CO1
	b) What do you understand hot and cold working processes?	L2	CO1
14	a) Explain the design considerations for the selection of Engineering Materials and their properties?	L2	CO1
	b) What are the manufacturing considerations in the design of Castings?	L2	CO1
15	a) Derive a relation for the shear stress developed in a shaft, when it is subjected to torsion.	L2	CO1
	b) A hydraulic press exerts a total load of 3.5 MN. This load is carried by two steel rods, supporting the upper b head of the press. If the safe stress is 85MPa and E= 210MPa find: 1. Diameter of the rods, and 2. Extension in the rod in a length of 2.5 m	L3	CO1
16	a) Explain the concept of stiffness in tension, bending, and torsion and combined situations?	L2	CO1
	b) Derive an expression for the impact stress induced due to a falling load.	L2	CO1