

GUJARAT TECHNOLOGICAL UNIVERSITY

BE-7 SEMESTER – OLD PAPER – S22 TO S25 – QUESTION BANK

Subject Name & Code:

Design of Machine Elements- 3171917

Chapter 1: Design Considerations

Repeated Questions:

1. **Standardization / Preferred Numbers:**

- **Q.** Find out the numbers of the R5 basic series from 1 to 10. (SUMMER 2023, 4 Marks)
- **Q.** It is required to standardize eleven shafts from 100 to 1000 mm diameter. Specify their diameters. (SUMMER 2022, 3 Marks)
- **Q.** It is required to standardize load-carrying capacities of dumpers... developing seven models... Specify their load carrying capacities. (SUMMER 2024, 4 Marks)

Other Important Questions:

1. **Manufacturing Considerations:**

- **Q.** Explain the manufacturing considerations to take into account while designing the assemblies. (WINTER 2024, 4 Marks)

2. **Tolerances:**

- **Q.** What is unilateral and bilateral tolerance? (WINTER 2023, 3 Marks)

3. **Ergonomics:**

- **Q.** Explain in detail aesthetic and ergonomic consideration in design. (WINTER 2023, 7 Marks)

4. **Standards:**

- **Q.** Explain different types of Standards used in Machine Design. (WINTER 2022, 3 Marks)

Chapter 2: Design of Coupling

Repeated Questions:

1. **Coupling Function & Types:**
 - Q. What do you mean by coupling? Give its applications. (SUMMER 2025, 3 Marks)
 - Q. Discuss the function of a coupling. Give at least three practical applications of it. (SUMMER 2023, 4 Marks)
 - Q. Explain the function of coupling. How it is differ from clutch? (WINTER 2024, 4 Marks)
2. **Flexible Coupling:**
 - Q. What are the advantages and disadvantages of bushed-pin flexible coupling? (SUMMER 2024, 3 Marks)
 - Q. Explain flexible coupling and what are its applications? (SUMMER 2023, 3 Marks)
3. **Rigid Flange Coupling (Protected vs. Unprotected):**
 - Q. Differentiate between... Protected and unprotected flange coupling. (SUMMER 2022, 3 Marks)
 - Q. What is the difference between protected and unprotected rigid flange couplings? (SUMMER 2025, 3 Marks)

Other Important Questions:

1. **Design of Muff Coupling (Numerical):**
 - Q. Design a muff coupling to connect two steel shafts transmitting 25 kW power at 360 rpm... (SUMMER 2024, 7 Marks)
 - Q. Design muff coupling to connect two steel shaft transmitting 40 kw at 350rpm... (WINTER 2023, 7 Marks)
2. **Design of Flange Coupling (Numerical):**
 - Q. Design and draw a protective type of cast iron flange coupling for a steel shaft transmitting 15 kW at 200 r.p.m.... (SUMMER 2022, 7 Marks)
 - Q. The shaft and the flange of a marine engine are to be designed for flange coupling... Find: 1. diameter of shaft; 2. diameter of bolts; 3. thickness of flange; and 4. diameter of flange. (SUMMER 2023, 7 Marks)
 - Q. A rigid coupling is used to transmit 20 KW power at 720 rpm... Determine the diameter of the bolts. (SUMMER 2025, 7 Marks)
3. **Power Capacity of Coupling (Numerical):**
 - Q. Calculate the power transmitting capacity of the rigid coupling having following specifications... (WINTER 2024, 7 Marks)

Chapter 3: Spring

Repeated Questions:

1. Spring Terminology:

- Q. Define the following terms: (i) Solid length (ii) Free Length (iii) Spring Index (iv) Wahl's stress factor (v) Surge in spring (vi) Spring rate (vii) Pitch. (SUMMER 2023, 7 Marks)
- Q. Explain following term regarding spring 1. Solid Length 2. Free Length 3. Spring index 4. Spring stiffness. (WINTER 2023, 4 Marks)

2. Curvature Effect (Wahl's Factor):

- Q. What is the curvature effect in a helical spring? How does it vary spring index? (SUMMER 2024, 3 Marks)
- Q. What is the curvature effect in a helical spring? How does it vary with spring index? (WINTER 2022, 3 Marks)

Other Important Questions:

1. Design of Helical Compression Spring (Numerical):

- Q. A safety valve of 60 mm diameter is to blow off at a pressure of 1.2 N/mm². Design a suitable compression spring... Calculate: 1. Diameter of the spring wire, 2. Mean coil diameter, 3. Number of active turns, and 4. Pitch of the coil. (SUMMER 2023, 7 Marks)
- Q. It is required to design a helical compression spring subjected to a force of 500 N... Design the spring and calculate: (i) Wire diameter; (ii) Mean coil diameter; (iii) Number of active coils; (iv) Total number of coils; (v) Free length of the spring; (vi) Pitch of the coils. (SUMMER 2024, 7 Marks)
- Q. A helical compression spring is made of music wire. The spring has to support a load of 150 N... (WINTER 2022, 7 Marks)
- Q. A mechanism used in printing machinery consists of a tension spring... Determine : 1. the initial torsional shear stress in the wire; 2. spring rate; and 3. the force to cause the body of the spring to its yield strength. (SUMMER 2022, 7 Marks)

2. Concentric Springs (Numerical):

- Q. A concentric spring consists of two helical compression springs one inside the other... Calculate: (i) The stiffness... (ii) The stiffness... (iii) The compression of each spring. (iv) The force transmitted... (v) The maximum torsional shear stress... (SUMMER 2024, 7 Marks)
- Q. A concentric spring consist of two helical compression springs having the same free length... Calculate: (i) the maximum force transmitted by each spring, (ii) the maximum torsional shear stress induced in each spring. (WINTER 2024, 7 Marks)

3. Leaf Springs:

- Q. What is nipping in a leaf spring? Discuss its role. (SUMMER 2022, 3 Marks)
- Q. Explain applications of multi-leaf springs and the objectives of nipping of leaf springs. (WINTER 2024, 3 Marks)
- Q. Derive the expression for determining the stress and deflection in full length and graduated leaves. (WINTER 2022, 4 Marks)

4. Spring Classification & Special Types:

- Q. Explain classification of spring. (SUMMER 2025, 3 Marks)
- Q. Explain the Belleville spring? And its application. (WINTER 2023, 3 Marks)
- Q. Write the design procedure of helical spring. (SUMMER 2025, 7 Marks)
