

GUJARAT TECHNOLOGICAL UNIVERSITY

BE-7 SEMESTER – OLD PAPER – S22 TO W24 – QUESTION BANK

Subject Name & Code:

Piping Design- 3170515

Unit 1: Fundamentals of Piping

Repeated Questions:

1. **Explain codes, standards and schedule number for pipes.**
 - Appeared in: W22 (Q1a, 03 marks), W24 (Q1b, 04 marks), S24 (Q4a(OR), 03 marks)
2. **Explain the selection criteria of material for pipe system.**
 - Appeared in: W22 (Q1c, 07 marks), S24 (Q1c, 07 marks), W24 (Q2c, 07 marks)
3. **Explain various methods of pipe fabrication with necessary diagrams/application.**
 - Appeared in: W22 (Q3a, 03 marks), S22 (Q1c, 07 marks), S24 (Q5a(OR), 03 marks), W24 (Q5c(OR), 07 marks)
4. **What is Schedule Number? / Define Schedule No.**
 - Appeared in: W22 (Q4a, 03 marks), S24 (Q1a, 03 marks)
5. **Explain mechanical properties of piping material.**
 - Appeared in: W23 (Q1c, 07 marks), W24 (Q2c, 07 marks)
6. **What are the general considerations while selecting piping materials?**
 - Appeared in: S22 (Q1a, 03 marks), W23 (Q1b, 04 marks)

Other Important Questions:

1. **Discuss types of flanges and Gaskets. / List out and explain various types of flanges.**
 - Appeared in: W22 (Q1b, 04 marks), S22 (Q3a, 03 marks), S23 (Q2c, 07 marks)
2. **Explain classification of pipes with suitable examples. / Briefly explain classification of pipe.**
 - Appeared in: W24 (Q1a, 03 marks), S23 (Q3c, 07 marks)
3. **Write the importance of Piping Design in chemical engineering.**
 - Appeared in: S23 (Q2a, 03 marks)
4. **Briefly explain the role of computer software in process piping engineering.**
 - Appeared in: S24 (Q1b, 04 marks), W24 (Q5a, 03 marks)
5. **Calculate allowable internal pressure P for Schedule 40 mild steel pipe having ultimate tensile strength (S value) of 65,300 psi.**
 - Appeared in: W22 (Q5a, 03 marks), S23 (Q1a-MCQ, 07 marks), S24 (Q1a, 03 marks)

Unit 2: Design Calculations for Piping

Repeated Questions:

- Discuss the steps for determination of optimum pipe size. / Which steps are to be followed while selecting the pipe size?**
 - Appeared in: S24 (Q3a, 03 marks), W22 (Q2a, 03 marks), W24 (Q5b, 04 marks), S22 (Q5a(OR), 03 marks)
- Explain equivalent length of pipe for fittings and valves. / Explain equivalent length of pipes and pipe fittings.**
 - Appeared in: S23 (Q1a-MCQ, 07 marks), W22 (Q2b, 04 marks), W24 (Q1b, 04 marks)
- What is NPSH and why does it matter? / Write a brief note on NPSH for a centrifugal pump. / Define...NPSH.**
 - Appeared in: S24 (Q2a, 03 marks), W23 (Q2b, 04 marks), W24 (Q2b(OR), 04 marks), S22 (Q4a, 03 marks)
- Estimate the optimum pipe diameter for a flow of dry chlorine gas...**
 - Appeared in: W22 (Q3b, 04 marks), W23 (Q2a, 03 marks)
- Discuss the Lockhart and Martinelli correlations and its applications. / Explain Lockhart and Martinelli method for calculation of pressure drop.**
 - Appeared in: S24 (Q3c(OR), 07 marks), W22 (Q4c, 07 marks), W24 (Q4c, 07 marks), S22 (Q3c(OR), 07 marks)

Other Important Questions:

Numerical on NPSH and Pump Power:

- **Problem:** Hexane at 37.8 °C is pumped through the system at a rate of 9.09 m³/h. The tank is at atmospheric pressure. Pressure at the end of the discharge line is 345 kPa g. The discharge head is 3.05 m and the suction lift is 1.22 m. The friction loss in the suction line is 3.45 kPa and in the discharge line is 37.9 kPa. The mechanical efficiency of the pump is 0.6. The density of hexane is 659 kg/m³ and its vapour pressure at 37.8°C is 33.71 kPa. Calculate (a) (NPSH)_A and (b) Power required by centrifugal pump.
- Appeared in: W22 (Q2c(OR), 07 marks), W23 (Q2c, 07 marks), S22 (Q2c(OR), 07 marks)

Numerical on Centrifugal Pump Performance:

- **Problem:** A centrifugal pump rotating at 1000 rpm delivers 160 liter/s of water against a head of 30m. The pump is installed where atmospheric pressure is 10⁵ Pa (absolute) and vapor pressure of water is 3 KPa (absolute). The head loss in the suction pipe is 0.2 m. Calculate: 1) Minimum NPSH 2) Maximum allowable height of the pump from the free surface of the sump.
- Appeared in: S24 (Q2c, 07 marks)

1. Numerical on Pressure Drop Calculation:

- **Problem:** Carbon dioxide is to be conveyed from the top of the stripper of an ammonia plant to a urea plant. Calculate the total pressure drop in the pipeline based on the given data (Flow rate, length, elbows, valves, velocity, etc.).

- Appeared in: W23 (Q2c(OR), 07 marks)
- 2. **Calculate the pipe size in mm based on the following data... (for Carbon Monoxide)**
 - Appeared in: S23 (Q5c, 07 marks)
- 3. **Briefly explain some of the issues associated with the operation of a centrifugal pump.**
 - Appeared in: S24 (Q2b, 04 marks)
- 4. **Discuss various characteristics curves for centrifugal Pumps.**
 - Appeared in: S24 (Q2c(OR), 07 marks), W24 (Q5c, 07 marks)
- 5. **What are the reasons for energy losses in pipelines?**
 - Appeared in: W22 (Q4a(OR), 03 marks)

Unit 3: Piping Component and Flow Through Pipeline

Repeated Questions:

1. **List the types of valves with their applications. / Explain various types of valves and their industrial application. / Write a brief note on gate/globe valve and its applications.**
 - Appeared in: S24 (Q3c, 07 marks), W22 (Q2c, 07 marks), W23 (Q3c, 07 marks), W24 (Q2c(OR), 07 marks), W23 (Q3c(OR), 07 marks)
2. **What is 'water hammer' in a process plant?**
 - Appeared in: S24 (Q3a(OR), 03 marks), W22 (Q2a, 03 marks), W22 (Q4a, 03 marks), W23 (Q3a, 03 marks), W24 (Q4a(OR), 03 marks)
3. **Explain steam separators and steam traps. / What is the use of Steam separators and steam traps?**
 - Appeared in: W22 (Q3a(OR), 03 marks), W23 (Q3a(OR), 03 marks), W24 (Q4a(OR), 03 marks)
4. **Explain types of gaskets and their selection criteria. / Discuss various types of gaskets and their selection criteria.**
 - Appeared in: S24 (Q4b, 04 marks), W22 (Q1b, 04 marks), W23 (Q3b(OR), 04 marks), W24 (Q4a, 03 marks)
5. **Explain various pipe fittings and their application in the industry. / Explain pipe fittings.**
 - Appeared in: W22 (Q2c, 07 marks), W22 (Q1b, 04 marks), W24 (Q1c, 07 marks)

Other Important Questions:

Numerical on Water Hammer:

- **Problem:** A valve is provided at the end of a cast iron pipe of diameter 150mm and thickness 10mm. The water is flowing through the pipe and is suddenly stopped by closing the valve. Find the maximum velocity of water when the rise in pressure due to sudden closure of the valve is 196.2 N/cm^2 . Modulus of elasticity of the pipe material is $11.772 \times 10^6 \text{ N/cm}^2$ and bulk modulus of water is $19.62 \times 10^4 \text{ N/cm}^2$.
- Appeared in: S24 (Q3b, 04 marks)

1. **Explain the advantages and disadvantages of the inverted bucket steam trap.**
 - Appeared in: S23 (Q4b, 04 marks)
2. **List various flow meters and explain any one in detail. / How to measure flow in the pipe line? Explain in brief.**
 - Appeared in: W22 (Q3b, 04 marks), W24 (Q3b(OR), 04 marks)
3. **State advantages and disadvantages of orifice meter. / Discuss the various locations for pressure taps in an orifice meter.**
 - Appeared in: W23 (Q1a, 03 marks), S23 (Q2b, 04 marks)
4. **Explain pumps with broad classification and selection criteria. / List various types of pumps with their applications. / Explain the factors influencing the choice of a pump.**

- Appeared in: W22 (Q3c, 07 marks), W22 (Q2b, 04 marks), W24 (Q2b, 04 marks), S22 (Q3c, 07 marks)

5. What is (1) Cavitation (2) Pump priming?

- Appeared in: S22 (Q4a, 03 marks), W24 (Q5a(OR), 03 marks)

Unit 4: Stresses & Pipe Thickness

Repeated Questions:

1. **Explain longitudinal and hoop stress. Derive the relation between hoop stress & longitudinal stress.**
 - Appeared in: S24 (Q4c, 07 marks), S23 (Q4c, 07 marks), S22 (Q5c, 07 marks), W23 (Q4c, 07 marks), W24 (Q2c(OR), 07 marks)
2. **Explain the importance of design pressure and temperature for a piping system. / What is operating pressure and operating temperature for Piping Systems? / Discuss Design Pressure & Design Temperature for Piping Systems.**
 - Appeared in: S24 (Q3b(OR), 04 marks), W22 (Q3a, 03 marks), W22 (Q4b, 04 marks), W23 (Q4a, 03 marks), W23 (Q7a, 03 marks), W24 (Q2a, 03 marks)
3. **Explain the method for deciding the wall thickness of the pipe. / Discuss the assumptions and steps for calculating the thickness of the pipe for the condition of internal and external pressure. / List out the steps for finding the thickness of a steel pipe using internal/external pressure.**
 - Appeared in: S22 (Q5b, 04 marks), W22 (Q4c(OR), 07 marks), W23 (Q4b, 04 marks), W23 (Q4b(OR), 04 marks)

Other Important Questions:

Derive the equation for the thickness required by a jacketed steel pipe using external pressure.

- Appeared in: W23 (Q4c(OR), 07 marks), W24 (Q3c(OR), 07 marks)
1. **What is design pressure and operating temperature for a piping system?**
 - Appeared in: W23 (Q4a(OR), 03 marks)
 2. **Numerical on Circumferential (Hoop) Stress:**
 - **Problem:** A thin cylindrical shell with an internal diameter of 125 mm and a wall thickness of 12 mm is subjected to a steam pressure of 10 N/mm². Find the circumferential stress in the shell material.
 - Appeared in: S23 (Q1a-MCQ, 07 marks)
 3. **Define: (1) Schedule number (2) Cavitation (3) Pump priming?**
 - Appeared in: S22 (Q4a, 03 marks)
 4. **Briefly Explain the applicability of ASME B 31.3 piping code. / Explain the applicability of various ASME piping codes.**
 - Appeared in: S24 (Q4a, 03 marks), W24 (Q4b, 04 marks)
