

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)**

**CLASS: ARCHITECTURE  
BRANCH: ARCHITECTURE & PLANNING**

**SEMESTER : 4TH  
SESSION : SP/2025**

**SUBJECT: AR251 BUILDING SERVICES-I (WATER SUPPLY & SANITATION)**

**TIME: 3 Hours**

**FULL MARKS: 50**

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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Q.1(a)	Draw the flow chart of the "Raw water treatment process." Explain different types of water distribution systems and layouts.	[5]	CO CO1 & CO2	BL Understand
Q.1(b)	In an axonometric section of a washroom show, the freshwater intake and wastewater outlet systems. Discuss the problems encountered while supplying water to high-rise buildings. What measures can be suggested to overcome these challenges?	[5]	CO1	Understand & Apply
Q.2(a)	Discuss the steps of the Solid Waste Management System. Draw and explain the following in water supply systems: i) Nipple, ii) Reducer, iii) Union, iv) Socket, v) Elbow, vi) Tee.	[5]	CO3	Understand
Q.2(b)	Sketch and explain Garbage Chute in High-Rise Buildings. Sketch and explain the following: i) Sanitary Landfilling, ii) Vermi-Composting, iii) Bio-gas Plants.	[5]	CO3	Understand
Q.3(a)	Differentiate between Floor trap and Floor drain. Sketch and explain different traps based on shapes. Differentiate with neat sketches between Single Stack System and Single-Stack Partially Ventilated System.	[5]	CO3	Understand & Analyse
Q.3(b)	Design a Toilet (washbasin+wc+bathing) of Size 1500mm X 2700mm. Draw the fixture layout plan (clearly marking the spaces required for different fixtures); further, with the help of a minimum of two Sections, specify the mounting height of different fixtures as per Indian Standards.	[5]	CO2 & CO3	Understand & Apply
Q.4(a)	Design a Residence on a 50m X 100 m site with a maximum 50% ground coverage abutting a 16 m wide road towards the shorter side (North line opposite the road). Further, sketch the plans for the building (GF including site, FF (if applicable), and Terrace), and in the design, highlight the plumbing schemes, including water supply and wastewater disposal.	[10]	CO4	Understand, Analyse & Apply
Q.5(a)	Differentiate between the Aerobic and Anaerobic sludge digestion process. Sketch the components of a Septic Tank. Draw a flow chart listing the steps of Sewage Treatment and explain the following: i) Oxidation Ponds, ii) Activated Sludge.	[5]	CO5	Understand
Q.5(b)	Discuss the initiatives of any two Sanitation programs by the Government of India in Rural areas. Give equations for the following explaining each component: i) Minimum Velocity for preventing sedimentation in Sewers ii) Manning's formula for Gravity Flow iii) Hazen-William Formula	[5]	CO5	Understand