SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)
Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai
Accredited by NAAC-UGC with 'A++' Grade (Cycle III) &
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COIMBATORE- 641 035, TAMIL NADU

B.E/B.Tech- Internal Assessment -III
Academic Year 2024-2025 (EVEN Semester)
Fourth Semester
Agricultural Engineering
23AGT205 – Strength of Materials for Agricultural Engineering
PART A

1. List the four types of end conditions for columns
2. How does Euler's buckling formula influence the design of agricultural silo structures?
3. Define Euler's critical load for a column with both ends hinged.
4. Calculate the critical buckling load for a column fixed at one end and free at the other, given length (L) and flexural rigidity (EI).
5. Interpret the term 'stability' in the context of gravity dams
6. Compare Euler's and Rankine's theories for column failure.
7. Assess the impact of water pressure distribution on the stability of a gravity dam.
8. Differentiate between gravity dams and earthfill dams.
9. What are the primary forces acting on a gravity dam?
10. Analyze the effect of increasing height on the stability of a gravity dam.
11. Examine the role of material properties in determining the failure mode of columns
12. List the four types of end conditions for columns and their effective lengths.
13. Define slenderness ratio and explain its significance in column design.
14. State the limitations of Euler's formula for long columns.
15. Explain the effect of eccentric loading on column stability.
16. Define the term "base width" in the context of gravity dam stability.
17. Why is the maximum height of a dam restricted by material strength?
18. How does the minimum base width of a dam ensure stability against overturning?

PART B

1. A column of 8m in length has one end fixed and the other free. Determine the effective length and derive the buckling load using Euler's formula.
2. A hollow cylindrical cast iron column is 4m long with both ends fixed. Determine the minimum diameter of the column if it has to carry a safe load of 250KN with a FOS of 5. Take the internal diameter as 0.8times the external diameter. Take Compressive stress = 550N/mm^2 and a = 1/1600 in Rankine formula.
3. A hollow mild steel tube 16m long, 8cm internal diameter, and 6mm thick is used as a strut with both ends hinged. Find the crippling load and safe load taking factor of safety as 3. Take E=2X10^{5}N/mm^2
4. Evaluate the conditions for dam stability and discuss how hydrostatic forces influence dam design.
5. A hollow mild steel tube 6m long, 4cm internal diameter, and 5mm thick is used as a strut with both ends hinged. Find the crippling load and safe load taking factor of safety as 3. Take E=2X10^{5}N/mm^2
6. Evaluate the impact of hydrostatic pressure on the stress distribution at the base of a gravity dam.
7. Explain the types of dams and describe their structural differences.
8. Justify the selection of materials used in gravity dam construction based on their ability to withstand stress and environmental factors.
9. A column is subjected to an eccentric axial load. Explain how the bending stress is calculated and its impact on the structural stability of the column.
10. Explain how bending stress analysis ensures the durability of wooden beams under heavy loads.
11. A slender column of length 4m with both ends fixed is subjected to an axial compressive load. Using Euler's formula, calculate the critical buckling load for the column. The column has a rectangular cross-section of 100mm × 200mm and is made of steel with a Young's modulus of 200 GPa. Discuss the limitations of Euler's formula and compare it with Rankine's formula for columns.
12. Explain how combined loading analysis is used to prevent failure in silo columns.
13. A steel column with both ends hinged has a length of 3m and a cross-section of 100mm × 100mm. Calculate the critical buckling load using Euler's formula.
14. Explain how the stability analysis ensures the dam's safety under hydrostatic pressure
15. Compare Euler's and Rankine's methods for column design and justify which is more suitable for practical engineering applications.
16. Assess the efficiency of different dam designs in maintaining stability under extreme weather conditions.
17. A steel column (E = 200 GPa) of length 4 m and circular cross-section (diameter 100 mm) is pinned at both ends. Calculate the critical buckling load using Euler's formula. What happens if the length is halved?
18. Explain Rankine's formula for columns and solve: A column with a Rankine constant of 1/7500 has a crushing stress of 300 MPa. If its slenderness ratio is 90, find the safe load.
19. Case Study: A dam in Uttarakhand showed cracks due to excessive eccentric loading. Propose remedial measures using stability analysis principles.
20. Case Study: The Bhakra Dam (India) – Evaluate its design parameters (base width, slope) for stability under extreme flood conditions.