BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – B.Tech.(CE)]-2021
Course Name – Hydraulic Structure
Course Code - PEC-CE702C
(Semester VII)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Identify the main parameters of a gravity dam.
   a) Height, Base width, Crest width
   b) Height, Crest width, Base thickness
   c) Base width, Crest width, Toe width
   d) Height, Base width, Toe width

(ii) State the primary concern of a gravity dam during an earthquake.
   a) Structural deformation
   b) Water leakage
   c) Increased load
   d) Thermal stress

(iii) Identify the component that is typically used to prevent thermal stresses in a dam.
   a) Cooling pipes
   b) Expansion joints
   c) Reinforced concrete
   d) Seismic joints

(iv) Classify the following type of arch dam: a dam with a uniform thickness throughout its height.
   a) Gravity arch dam
   b) Double curvature arch dam
   c) Thin arch dam
   d) Buttress dam

(v) Select the term that describes the angle formed at the central section of an arch dam for maximum efficiency.
   a) Critical angle
   b) Most economical central angle
   c) Optimal angle
   d) Maximum stress angle

(vi) Identify the type of arch dam design that is characterized by a varying thickness across its height.
   a) Constant thickness design
   b) Thin cylinder theory design
   c) Variable thickness design
   d) Uniform pressure design

(vii) Identify the primary function of a buttress dam.

a) To store water
b) To divert rivers
c) To control floods
d) To support the water pressure

(viii) Classify the following as a type of buttress dam:
a) Arch dam
b) Gravity dam
c) Multiple arch dam
d) Earth dam

(ix) Choose the feature that describes the most economical profile of a buttress dam with no tension:
a) Steep upstream face
b) Vertical downstream face
c) Slightly sloping upstream face
d) Horizontal base

(x) State the primary purpose of an energy dissipater below a spillway.
a) Enhance aesthetic value
b) Reduce flow velocity
c) Increase water temperature
d) Support aquatic life

(xi) Identify the type of spillway that directs water through a side channel.
a) Syphon spillway
b) Side channel spillway
c) Shaft spillway
d) Chute spillway

(xii) Classify the types of weirs based on their overflow characteristics.
a) Sharp-crested and broad-crested
b) Vertical and inclined
c) Fixed and adjustable
d) Straight and curved

(xiii) Identify the main purpose of a barrage in river management.
a) To increase the river depth
b) To control river flow and water level
c) To divert the river course
d) To store floodwater

(xiv) Classify the components of a barrage designed to control river flow.
a) Sluice gates, weir crest, and approach channel
b) Energy dissipater, spillway, and apron
c) Embankment, sluice gate, and downstream apron
d) Weir crest, sluice gate, and flow net

(xv) Select the method used to design a sloping glacis weir for maximum efficiency.
a) Optimal slope angle
b) High crest elevation
c) Large foundation base
d) Deep downstream pool

Group-B
(Short Answer Type Questions) 3 x 5=15

2. List the critical design considerations for ensuring the safety and durability of an arch dam. (3)
3. Identify the role of Unit Column Theory in buttress dam design. (3)
4. Explain the importance of selecting the correct buttress design in relation to site conditions and load distribution. (3)
5. Determine the most economical central angle for an arch dam using Thin Cylinder Theory. (3)
6. Select the appropriate stability analysis methods for gravity dams. (3)

OR

Analyze the impact of foundation elasticity on stress distribution in a gravity dam. (3)

Group-C
(Long Answer Type Questions) 5 x 6=30

7. Analyze the forces acting on a gravity dam and their influence on the stability of the structure. (5)
8. Define the various types of buttress dams and explain their key characteristics in terms of structure and function. (5)

9. Propose design modifications to a standard buttress dam that could enhance its performance in areas with high rainfall or frequent flooding, explaining the reasoning behind the changes. (5)
10. Describe the key components of spillways and their roles in ensuring the safe passage of water. (5)
11. Analyze the hydraulic behavior of a side channel spillway and its application in reservoir design. (5)
12. Evaluate the design considerations involved in constructing an arch dam, particularly in relation to load distribution and structural safety. (5)

OR

Critique the effects of structural flexibility and foundation interaction on the long-term stability of an arch dam. (5)

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