

UNIT – III – DIVERSION AND IMPOUNDING STRUCTURES

PART – B - 2 Marks

1. What is meant by Headworks? Classify its types.

Any hydraulic structure which supplies water to the off-taking canal is called a headwork.

Headwork may be

- Storage headwork.
- Diversion headwork

2. Define Diversion Headwork.

Diversion head works is a structure constructed across a river for the purpose of raising the water level in the river so that it can be diverted into the off taking canals.

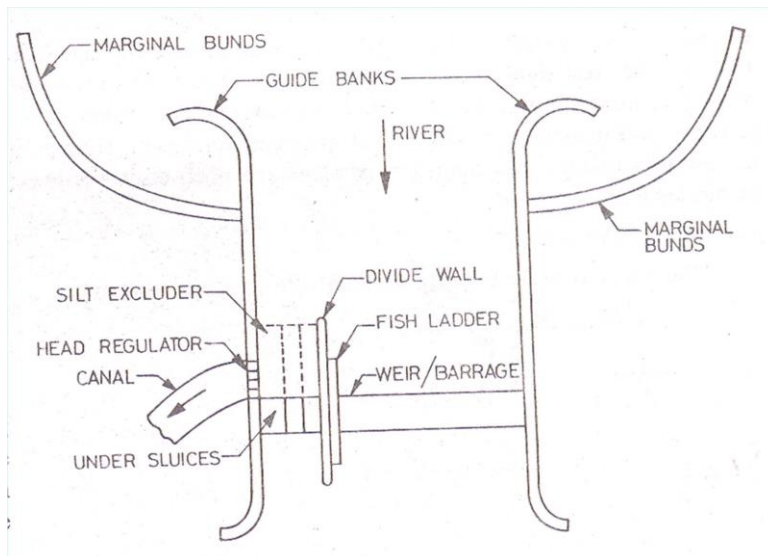
3. Tell the reason for construction of Diversion headwork.

- It raises the water level on upstream side.
- Other uses of this is to regulates the supply of water into canals.
- It controls the entry of silt into canals.
- It provides some pondage creating small pond.
- It helps in controlling the vagaries of river.

4. What are the components of Diversion headwork?

- Weir (or barrage) proper
- Under sluice
- Divide wall
- Fish ladder
- Control head regulator
- Silt excluder, silt ejector
- River training works: guide banks, marginal bunds

5. Draw layout of diversion headwork.



6. Define weir.

A weir is a raised concrete (or masonry) crest wall constructed across the river width. It may be

provided with a small shutter on its top. Most of the raising water (ponding) is done by solid wall and very little by shutters.

7. Differentiate Weir and Barrage

Weir	Barrage
Low cost	High cost
Low control on flow	Relatively high control on flow and water levels by operation of gates
No provision for transport communication across the river	Usually, a road or a rail bridge can be conveniently and economically combined with a barrage wherever necessary
Chances of silting on the upstream is more	Silting may be controlled by judicious operation of gates
Afflux created is high due to relatively high weir crests	Due to low crest of the weirs (the ponding being done mostly by gate operation), the afflux during high floods is low. Since the gates may be lifted up fully, even above the high flood level.

8. What are the causes and failure of weir?

- Failure due to piping and undermining
- Failure due to uplift pressure
- Failure by hydraulic jump
- Failure by scouring during floods

9. List the functions of under-sluices

- Preserve a clear and defined river channel approaching the regulator.
- Control the silt entry into the canal.
- Pass the low floods without dropping the shutter of the main weir.
- Provide greater water-way for floods, thus lowering the flood level.
- They scour the silt deposited on the river bed above the approach channel.

10. What are the functions of fish ladder in Diversion headwork?

The tendency of fish is to move from upstream to downstream in winters and from downstream to upstream in monsoons. This movement is essential for their survival. For the movement of the fishes along the course of the river, the fish ladder is essential. In the fish ladder, the baffle walls are constructed in the zigzag manner

11. Write short notes on concept of Bligh's theory

Bligh assumed that the water which percolates into the foundation creeps through the joint between the profile of the base of weir and the subsoil. Of course water also percolates into the subsoil. He then stated that this percolating water loses its head en-route. The seeping water finally comes out at the downstream end. According to Bligh water travels along vertical, horizontal or inclined path without making any distinction. The total length covered by the percolating water till it emerges out at the downstream end is called a creep length. List the types of open well irrigation.

12. Bligh's theory had certain limitation. Why?

- In his theory Bligh made no distinction between horizontal and vertical creep lengths.
- The idea of exit gradient has not been considered.
- The effect of varying lengths of sheet piles not considered.
- No distinction is made between inner or outer faces of the sheet piles.
- Loss of head is considered proportional to the creep length which in actual is not so.
- The uplift pressure distribution is not linear as assumed but in fact it follows a sine curve.
- Necessity of providing end sheet pile not appreciated.

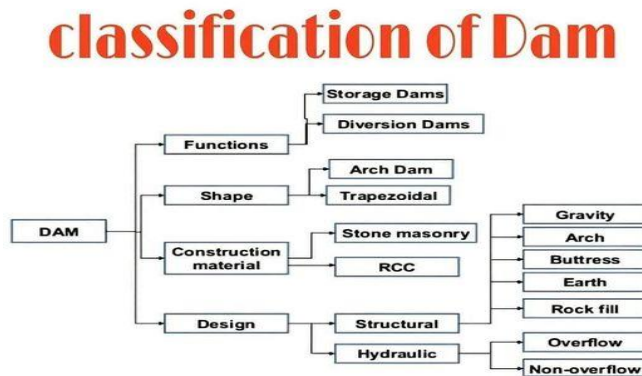
13. Differentiate Khosla Theory Vs Bligh's Thoery.

The seepage water does not creep along the outlines of hydraulic structure as started by Bligh, but on the other hand, In khosla's theory this water moves along a set of stream-lines.

14. Define dam

A dam is a structure built across a river or stream to hold back water.

15. List the classifications of dam



16. Define storage dam

Storage dams are constructed to store water during the monsoon season when the water is available in excess amount and the flow of water in the river is considerably good

17. Define Diversion dam

Diversion dams are mainly constructed to divert water to the river. The storage capacity of the diversion dam is lesser.

18. Write the **Classification Based on the Mod or Resistance Offered by the Dam against External Forces**

- (i) Gravity dams
- (ii) Buttress dams
- (iii) Arch dams.

Gravity dams resist all the external forces acting on the dam by virtue of its weight. Every effort is made to make dam more heavy so as to increase its stability.

Arch dams resist effect of external forces by arch action. The dams are curved in plan and are subjected to compressive stresses only.

Buttress dam is also subjected to same forces as gravity and arch dams. The total uplift pressure is reduced to a very small magnitude because of the gaps between the buttresses.

19. Define an arch dam

An arch dam is a dam curved in plan and carries at major part of its water load horizontally to the abutments by arch action.

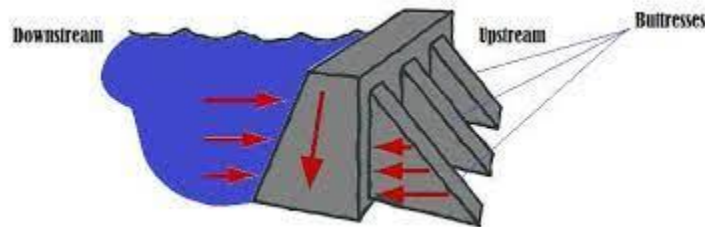
20. What are the important types of arch dams?

The arch dams may be divided into the following three types:

- ❖ Constant radius dam.
- ❖ Variable radius dam, and
- ❖ Constant angle dam.

21. Write short notes on butters dams?

A buttress dam or hollow dam is a dam with a solid, water-tight upstream side that is supported at intervals on the downstream side by a series of buttresses or supports. The dam wall may be straight or curved. Most buttress dams are made of reinforced concrete and are heavy, pushing the dam into the ground.



22. Mention site condition favorable for construction of butters dam?

The buttress dam is suitable where the rock is capable of bearing pressures of 2 - 3 MPa. Buttress dams require between a half and two thirds of the concrete required for a gravity section, hence making it more economical for dams over 14m. Additional skilled labour is required to create the formwork.

23. List the function served by component parts of butters dam?

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24. What are the advantages of butters dam?

- ❖ Thin section with one-third to one-half economy in concrete compared to gravity dam of similar height
- ❖ No problem of uplift or foundation drainage
- ❖ Can be constructed on weak foundations
- ❖ Vertical component of water resting against upstream sloping deck add to the stability of the dam.

25. What is meant by gravity dams?

A gravity dam is a dam constructed from concrete or stone masonry and designed to hold back water by primarily using the weight of the material alone to resist the horizontal pressure of water pushing against it.

26. What are the main points to be considered while selecting a site to a gravity dam construction?

- ❖ Topography.
- ❖ Geology and Foundation Conditions.
- ❖ Availability of materials.
- ❖ Spillway size and location.
- ❖ Earthquake zone.
- ❖ Height of the Dam.
- ❖ Other factors such as cost of construction and maintenance, life of dam, aesthetics etc.

27. List out the forces acting on a gravity dam?

- ❖ Water Pr.
- ❖ Weight of Dam
- ❖ Uplift Pr.
- ❖ Pr. Due to EQ
- ❖ Ice Pr.
- ❖ Wave Pr.
- ❖ Silt Pr.
- ❖ Wind Pr.

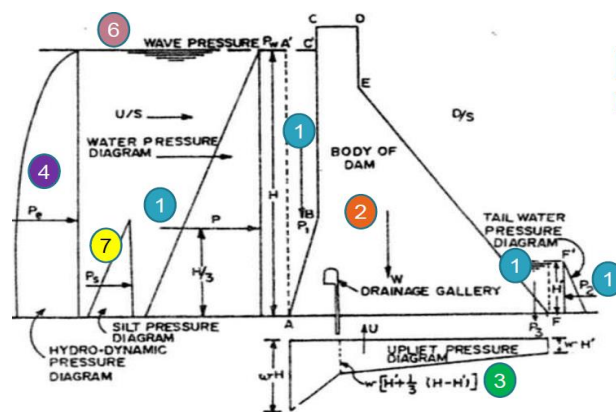


FIG. 8.1 FORCES ACTING ON A GRAVITY DAM.

28. What is earthen dam? Under what circumstances they are preferred?

Earth fill dam, also called Earth Dam, or Embankment Dam.

Dam built up by compacting successive layers of earth, using the most impervious materials to form a core and placing more permeable substances on the upstream and downstream sides.

Earthen dams are preferred where length of dam is more and good soils are available. Earthen dam is safer than concrete or masonry dam because it is flexible.. It is preferred because it is

constructed by locally available material and does not need strong foundation as required for masonry or concrete dam

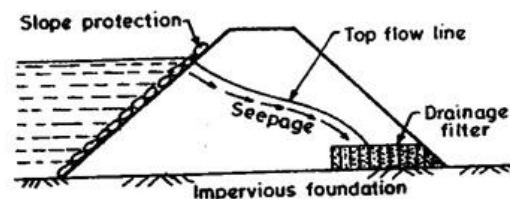
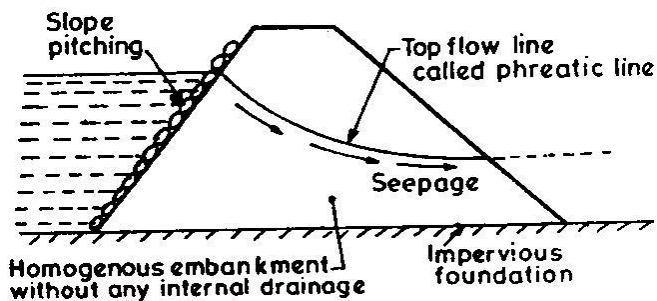
29. List out the different types of earthen dams?

- ❖ Homogeneous Dam
- ❖ Rolled Fill Dam
- ❖ Zoned Dam
- ❖ Diaphragm Dam
- ❖ Hydraulic fill Dam

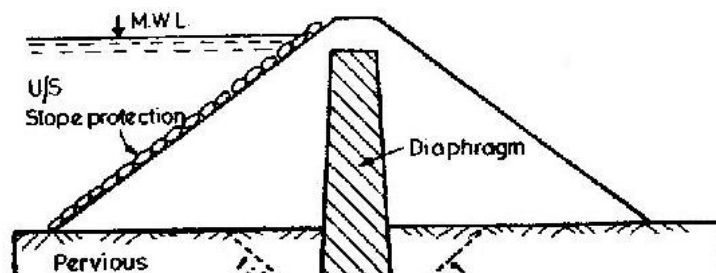
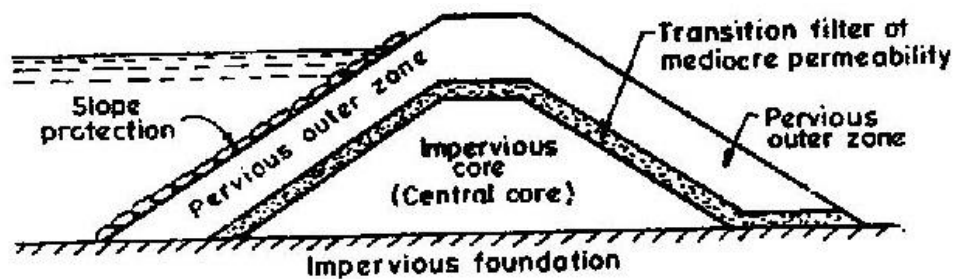
30. Name the various forces causing instability in earthen dam? (or) What are the causes of failure of earthen dam?

- ❖ Hydraulic Failure
- ❖ Seepage failure
- ❖ Structural Failure
- ❖ Failure due to Earthquakes

31. Draw the neat section of earthen dams (all types)?

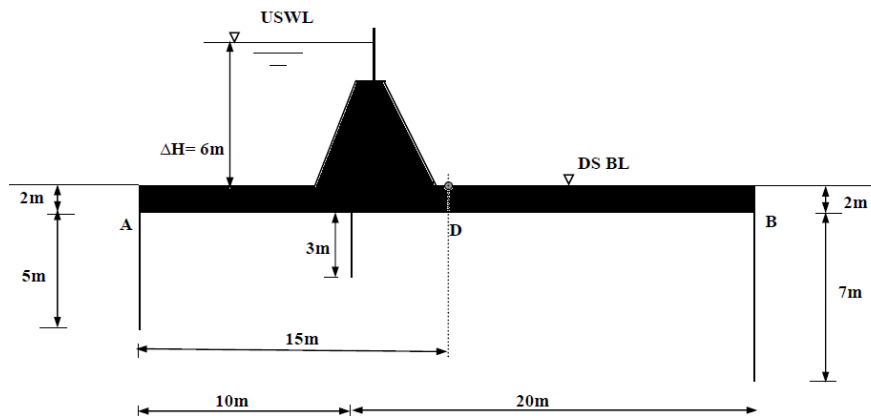


Homogeneous embankment provided with a drainage filter.



PART – C - 14 Marks

1. Draw the layout of Diversion head works and explain the each component briefly.
2. Discuss the causes for failure of weir and give remedies to rectify those failures.
3. Explain the types of weir with neat sketch
4. Explain Causes of Failure of Weir with neat sketch
5. Explain remedies of Failure of Weir with neat sketch
6. Discourse in detail about how the bligh's theory used to calculate the uplift pressure of weir.
7. Describe about the concept of khosla's theory.
8. Summarize the procedure to design a vertical drop weir.
9. Find the hydraulic gradient and the head at point D of the following structure for Static condition. The water percolates at A and exits at B. Use bligh's theory.



10. List the types of dams and explain and one type
11. List and explain the types of dams based on material used
12. Distinguish the Selection of Site for Dam
13. Discuss about gravity dam
14. Discuss about components of gravity dam with neat sketch
15. Explain briefly about different forces that may act on a gravity dam with neat sketch. Indicate their magnitude, direction and locations.
16. Explain the failures occurred on gravity dam and give precautions to be taken
17. Explain elementary profile of dam
18. Enumerate the different types of earth dams with neat sketch.
19. Discuss about components of earthen dam with neat sketch
20. What are the advantages & disadvantages of gravity dams over other type?
21. Explain the causes & failures of earthen dam.
22. Discuss about components of arch dam with neat sketch
23. Discuss about types of arch dam with neat sketch

