SCHEME OF VALUATION. -/-

Rev(15) (10)

Irrigation Engineering.

Course Code: 4012.

Qtn. No:	Scoring Indicator.	Split up	Sub Total	Total
I, 1	Process of water being lost from the leaves of trees from their pores		2	
2	The tract of land which contributes water in to a stream or a reservoir		2	
3.	Movement of water under the foundations of Irrigation structure with certain amount of pressure, This movement is called percolation.		2.	
4	Also called seepage line; The top flow line of a saturated soil mass below which seepage takes place, is called the phreatic line		2.	
5	Drain passes over the canal without lowering the bed of the canal		2.	10
II 1	Let D → Duty of water hectares/cumec B → Base period in no. of days. 'Δ' → Depth of water in Meters. 1 cumec flowing for a base period of 'B' days provides a volume of water equal to 1×60×60×24×B cubic meters			
	Qty of water in cms required for flooding 1 hectare (10,000 m²) of area with a depth Δ meters	2		
	= 1 × 10,000 × Δ cubic meters.			
	∴ No of hectors that can be irrigated by 1 cumec flowing for B days = $\frac{1\times60\times60\times24\times B.}{1\times10,000\times\Delta}$	2		
	$D = \frac{86400\times B}{10000\times\Delta} = \frac{8.64\,B}{\Delta}$	2	6	

II 2 1. Rain fall pattern.
2. Character of Catchment Surface.
3. Topography
4. Vegetal Cover.
5. Shape & Size of catchment.
6. Geology of the area.
7. Weather Condition. 1×6 = 6

(any six)

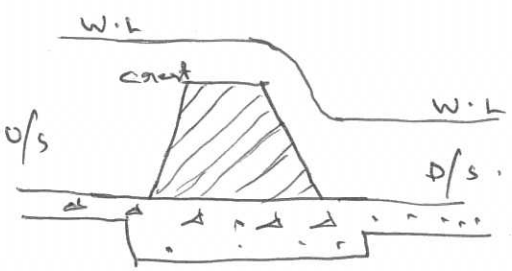
3 Weir: An impervious barrier which constructed across a river to raise the water level on the upstream side. 2

Barrage: When adjustable gates are installed over a weir to maintain the water surface at diff. levels at diff. time is known as barrage 2

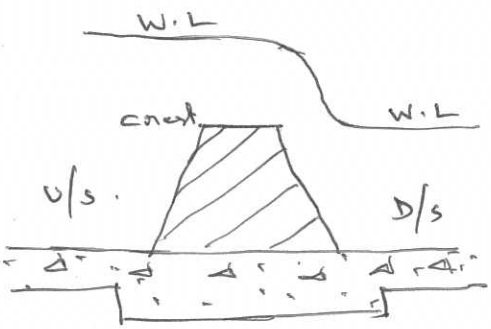
6

fig 2

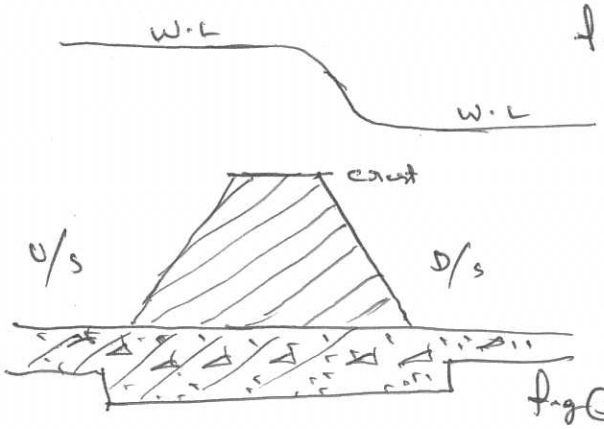
4 1. Weir with a free over fall fig(1)
2. Weir Under floatation. fig(2)
3. Weir fully submerged. fig(3)



fig(1)



fig(2)



fig(3)

3×2 = 6

II 5. 1. Flood Water should not overtop an earth dam Under any condition

2. The seepage or saturation line should never emerge out of the d/s face of an earth dam.

3. There should be no possibility of piping in or below the dam.

4. The slope given to u/s and d/s face should be such as to stable even in Worst Condition.

5. Free flow of Water from upstream face to d/s face should never be allowed.

6. U/s face should be strong enough to resist all possible forces. 1×6 6

7. D/s face should be strong, gullying due to rain, etc

(any six)

6. 1. Aqueduct → Canal over drain.

2. Syphon Aqueduct → H.F.L of drain touched the canal bed level, that case drainage is depressed below the crossing to form an inverted Syphon

3. Super passage: Drain passes over Canal without lowering bed of canal.

4. Syphon :- Similar to Super passage. If F.S.L of the canal is not sufficiently below the bed level of drainage, the Water of Canal is to be syphoned through the drain by lowering bed of the Canal. 4×1½ 6

II 7 1. Saves water for extending Irrigation.
2. Water logging can be avoided.
3. Reduces the cost of maintanance of canals.
4. Permits water to flow at higher Velocities.
5. checks growth of weeds on the canal bed
6. Prevents canal breaches. 1X6 6

III a. 1. Rain fall
2. Evaporation.
3. Base period of a crop.
4. Soil characteristics.
5. Type of crop.
6. Defects in Using Water
7. method of Cultivation
8. Quality of water.
9. Skill of cultivator.
10. Topography of land
(any seven) 1X7 7

b Duty D = 1400 hect/cumec.

Base period 25th Nov to 21st March.

days Nov Dec Jan Feb March.

7 + 31 + 31 + 28 + 21 = 118 days. 2

$D = \frac{8.64\,B}{\Delta}$ or $\Delta = \frac{8.64\,B}{D}$ 3

$= \frac{8.64 \times 118}{1400} = 0.7282$ Meters.

3

$\Delta = \underline{72.82}$ cms.

8

15

IV a. 1. Arithmetic Avg. method

$$\text{Avg. rain fall} = \frac{\text{Total rain fall}}{\text{No. of rain guage stns.}}$$ 2

2. By Theisson's polygon method.

$$P_A = \frac{A_1P_1 + A_2P_2 + A_3P_3 + \dots + A_nP_n}{A_1 + A_2 + A_3 + \dots + A_n}$$ 2

$$P_A = \frac{\Sigma (P \times A)}{\Sigma A}$$

3. Isohytal method.

$$P_{av} = \frac{A_1\left(\frac{P_1+P_2}{2}\right) + A_2\left(\frac{P_3+P_4}{2}\right) + \dots A_{n-1}\left(\frac{P_{n-1}+P_n}{2}\right)}{A_1 + A_2 + \dots + A_n.}$$ 3

$$P_{av} = \frac{\Sigma A\left(\frac{P_1+P_2}{2}\right)}{\Sigma A}$$

→ Most accurate method.
→ Enables interpretation of all available data.

b. By 1) Surface floats
2) Velocity rods.
3) Current meters.

Surface floats are pieces of wood, hollow metalic cylinders or corked bottles. 2

Single float & Double float.

Velocity rods → Circular Wooden rod of 5cm ϕ With a hook at the top. It is weighed at the bottom by a pieces of metal to keep it in a Vertical Position. 3

Current meter: → It gives Correct result. They operate by a dry battery cell and are of two kinds of Cup meters and propeller meters. 3

explanation With fig.— 8 15

V a. Effect of percolation on an Irrigation structure like Weir to cause Uplift pressure on the structure and topple the structure at any moment. 3

To keep it checked the length of Creep should be properly calculated and provide protective Works. like

1. U/s Stone pitching.
2. U/s apron.
3. U/s Curtain Wall.
4. D/s Apron. 4 7
5. D/s Curtain Wall
6. Talus.
7. Protective blocks.

b 1. Materials required for construction are locally available.
2. Section of river should be narrow
3. Site should ~~have~~ give facilities for economical and safe disposal of Water.
4. Percolation losses in the region Should not be excessive.
5. Demand for Water Should be Sufficiantly large. 1X8 8 15
6. No. of cross drainage ~~Work~~ Should be less
7. Economical line of Canal Should be available.
8. Communication to the Site good

VI a 1. It raises the water level in the river so that the command area can be increased.

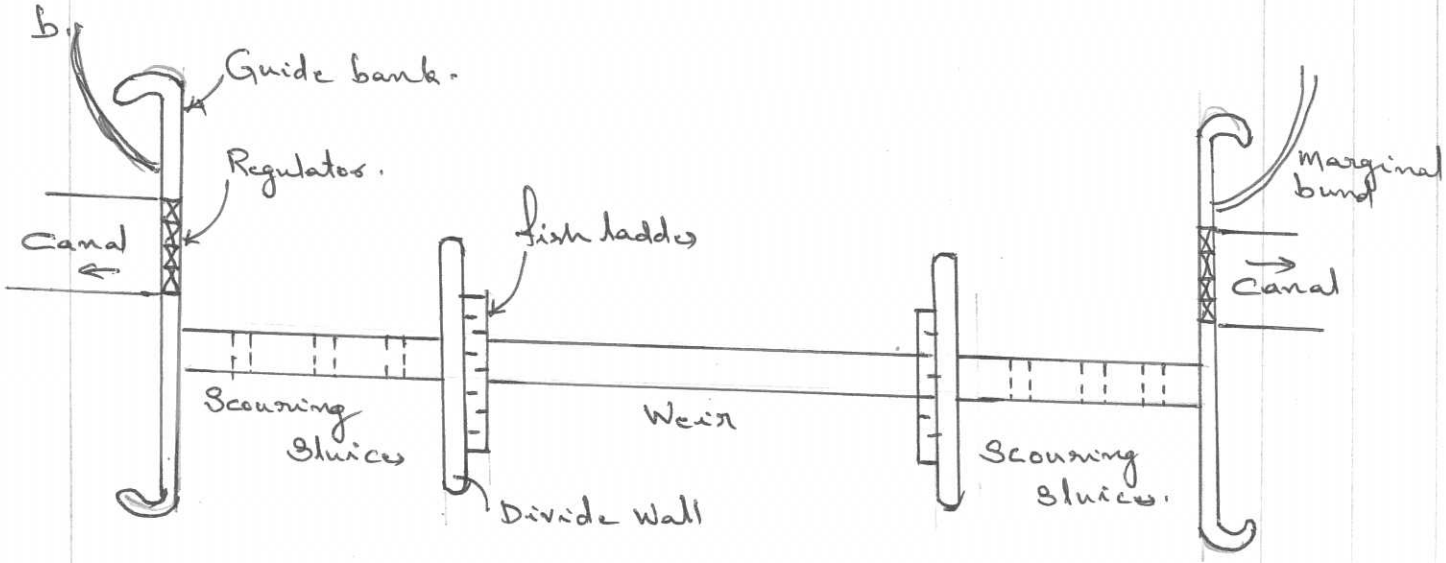
2. It regulates the intake of water in to the canal

3. It control silt entry in to the canal

4. It reduces fluctuations in the level of supply in the river.

5. It stores water for tiding over small periods of short supply. 7

b.



5+3 8

15

VII a. $H > \frac{\nearrow}{w(H\rho)}$ → High dam.

$H < \frac{\nearrow}{w(1+\rho)}$ → Low dam.

$\nearrow$ → allowable safe compressive stress for the material of dam in kN/m^2

w → Density of water in kN/m^3

ρ → Specific gravity of material 7

VII b

1. Hydraulic failure
2. Failure due to Slipping of the bund
3. Failure due to Seepage.

· explanation + fig. 3 5 8 15

VIII a.

1. Open Spill ways
2. Siphon Spill ways
3. Straight drop Spill way
4. Shaft Spill way
5. Trough Spill way
6. Side channel Spill way 7

b. 1. Geological factors.

a. Reservoir catchment must not have loose soil cover.
b. Area of reservoir – far away from Earth quake region
c. Bed impermeable – not allow quick Percolation.
d. Free from harmful salts
e. ~~Sto~~ Site Should not lying over excessively faulted rocks. 4

2. Topographical factors.

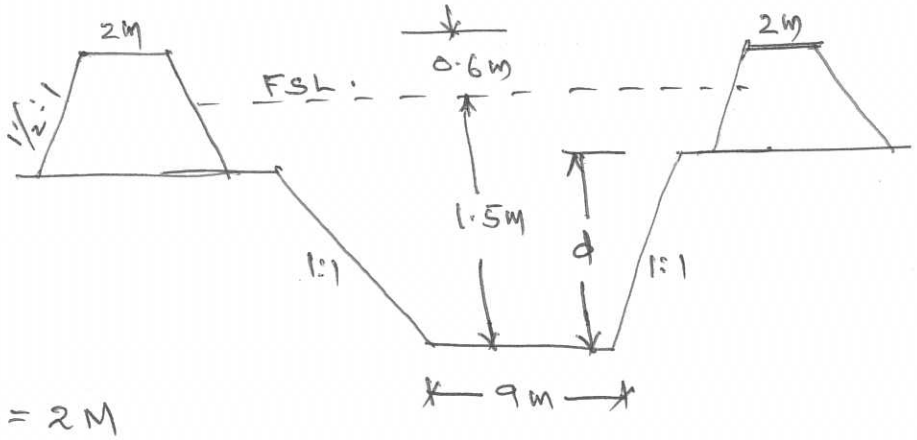
a. Basin should be Wide above the dam site
b. Have Steep Side Slope – for max Storage
c. Narrow out let → reduce Cost of construction of dam. 2

3. Other miscellaneous factors.

a. Shouldnot Submerge Valuable land
b. Should not too far away from Irrigation land 2 8 15
c. Catchment area of reservoir should produce max. runoff.

IX a. 1. Canal in full cutting
2. Canal in full banking
3 Canal in partial cutting (with fig) 7

b.



2

$b = 2M$

$B = 9\ m$

$h = 1.5 + 0.6 = 2.1\ m.$

$d = ?$ balancing depth.

Excavated area $= (B+d)d.$

Two embankments $= 2\left[\frac{1}{2}(b+b+3(h-d)\right](h-d)$ 2

For balancing -

$Bd+d^2 = \left[2b+3h-3d\right](h-d)$

$d^2 - d\left(b+\frac{B}{2}+3h\right)+h\left(b+\frac{3}{2}h\right)=0.$

$d^2 - d\left(2+\frac{9}{2}+3\times2.1\right)+2.1\left(2+\frac{3}{2}\times2.1\right)=0.$ 2

$d^2 - 12.8d + 10.815 = 0.$

~~$d = 11.89$~~ $d = 11.89$ / ~~0.909~~ or 0.909

$\therefore$ 11.89 is an absurd value 2 8 15

$\therefore d = \underline{0.91\ m}.$

X a. 1. Loss of Top soil
2. Soil Compaction.
3. Reduce organic & fertile Matter.
4. Poor drainage
5. Increased soil acidity level.
6. Affects plant reproduction.
7. Water pollution.
8. Long teams Erosion. any 7 1×7 7

X b
1. Fertilisers can be Used very economically
2. Erosion Can be Controlled.
3. More ~~not~~ helpful during Sowing Stage.
4. Uniform application of Water is possible.
5. Water is Used Very economically.
6. Land preparation is not required
7. Crop damage from frost Can be reduced 1×8 8
8. It is a standby drainage system 15
