

Course / Subject Name NQ CIVIL-324 HYDRAULICS & IRRIGATION ENGINEERING

A. MCQs

Formative Assessment (Part A)	Formative Assessment (Part B)	Formative Assessment (Part C)	Formative Assessment (Part D)
<i>LU (01-04)</i> - The specific weight of water is taken as 1000 kg /cm³ 9810 N/m³ - one ml/cm³ 1000 kg /m³ - The ratio of the specific weight of a liquid to the specific weight of water is called - Specific weight - Specific gravity - Specific volume - Unit weight - Specific gravity is expressed in - gram/cm³ - kg/m³ - Nil	<i>LU (05-08)</i> - The quantity of a liquid flowing per second through a pipe is termed as - Velocity - Discharge - Acceleration - All of these - Unit of discharge in S.I system. - Cumec - Netwon/second - Meter/second - ft/sec - Formula of discharge $Q = V/A$ $Q = A/V$ $Q = AV$ - All of these	<i>LU (09-12)</i> - An opening in the side of a tank with the upstream liquid level below the top edge of the opening. - Orifice - Mouthpiece - Notch - Weir - Bottom edge of a notch is called - Head - Sill - Nappe - Bed - The sheet of liquid flowing over a notch	<i>LU (13-16)</i> - What is the primary factor that determines the water requirement of crops? - Soil type - Temperature - Crop type - Irrigation method - What is the term used to describe the volume of water required to be delivered to crops to meet their irrigation needs? - Irrigation demand - Crop yield - Command statement

d. Unity 4. Atmospheric pressure is measured by a. Barometer b. Piezometer c. Manometer d. All of these 5. Value of standard atmospheric pressure is taken as column of height of water equal to a. 14.7m b. 10.3m c. 101.3m d. 0.76m 6. Pressure of one Pascal 'Pa' is equal to a. 100 Lb/in² b. one kg/m² c. one N/m² d. 100 N/m² 7. Piezometer tube is used for to find: a. Velocity b. Pressure c. Area d. Specific Gravity	4. In a continuity of flow if area of flow decrease then velocity will a) Increase b) Decrease c) Constant d) No effect 5. A flow in which the velocity do not change from point to point is termed as a) Steady flow b) Uniform flow c) Laminar flow d) Turbulent flow 6. If at any section in the passage of flow the rate of discharge remains constant, the flow is termed as a) Steady flow b) Uniform flow c) Laminar flow d) Turbulent flow 7. For a perfect incompressible liquids flowing in continuous stream, Total energy of particles remains same while particles moves from one	a) sheet of liquid b) Flow of liquid c) Nappe d) None of these 4. Best shape of notch a) Triangular b) Rectangular c) Trapezoidal d) Circular 5. Purpose of providing a notch is to measure. a) Velocity b) Discharge c) Sound d) Bed 6. Discharge measured by a notch is of this type a) Actual b) Theoretical c) Total d) Anyone	d) Evapotranspiration rate 3. Which of the following irrigation methods is most efficient in terms of water use? a) Flood irrigation b) Furrow irrigation c) Sprinkler irrigation d) Drip irrigation 4. Which of the following crops is most tolerant of water stress? a) Rice b) Corn c) Tomato d) Cotton 5. What is the term used to describe the amount of water that can be stored in the soil and is available to plants?
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8. Pressure measured by manometer is called as a) Gauge pressure b) Atmospheric pressure c) Absolute pressure d) All of these 9. Heavy liquid used in manometer is a) Water b) Mercury c) Bromide d) none of these 10. The statement 'All liquid insert pressure in all directions equally' is called. a) Newton's law b) Pascal law c) Archimedes' law d) Engineering law 11. Position of centre of pressure on a drowned surface lies	position to the others. This statement is called a) Continuity Equation b) Bernoulli Theorem c) Pascal law d) Archimedes Principle 8. According to Bernoulli Equation a) $Z+p+v=C$ b) $Z +P/w+v/g =C$ c) $Z +P/w+v^2/g =C$ d) $Z +P/w+v^2/2g=C$ 9. Bernoulli Equation is applied for a) Venturimeter b) Orifice meter c) Pitot Tube d) all of these 10. A venturimeter is used to measure a) velocity of flowing liquid b) Discharge of flowing liquid c) Pressure of flowing liquid d) all of these 11. A Pitot tube is used to measure	7. Formula used to determine discharge through a right angled vee-notch a) $\sqrt{2gh}$ b) $1.147h^{5/2}$ c) $1.1417h^{3/2}$ d) $9.81 h^{3/2}$ 8. A weir is a structure built across a river or canal to a) Control water flow b) Store water c) Divert water d) None of the above 9. The purpose of a weir is to a) Increase the velocity of water b) Decrease the velocity of water c) Store water d) None of the above 10. The type of flow that occurs over a weir is a) Laminar flow	a) Field capacity b) Permanent wilting point c) Available water capacity d) Soil moisture tension 6. What is the recommended method for determining crop water requirements? a) Soil moisture sensors b) Weather data c) Crop growth stage d) All of these 7. Which of the following irrigation methods is the most efficient in terms of water conservation? a) Flood irrigation b) Dip irrigation c) Sprinkler irrigation d) Furrow irrigation 8. Which of the following irrigation methods is
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always.....the centroid of the surface a) Below b) At c) Above d) Anywhere 12. A circular plate is immersed vertically in water, total pressure on it will be calculated by the formula a) $\omega A \bar{x}$ b) $\pi R x$ c) $\pi r^2 x$ d) $\pi D x$ 13. Submerged weight of a body as compared to that in air is a) Same b) More c) Less d) No effect 14. A gravity dam resists water pressure due to its a) Height b) Top width c) weight	a) velocity of flowing liquid b) Discharge of flowing liquid c) Pressure of flowing liquid d) all of these 12. In order to avoid the tendency of the separation at the throat in a venturimeter, the ratio of diameter at throat to that of the pipe a) 1/16 to 1/8 b) 1/8 to 1/4 c) 1/4 to 1/3 d) 1/3 to 1/2 13. A long pipe is considered whose length is more thantimes of its diameter. a) 10 b) 100 c) 1000 d) 500 14. Hydraulic mean depth of a circular pipe is equal to a) $d/2$ b) $d/4$ c) $d/6$	b) Turbulent flow c) Transitional flow d) Steady flow 11. The height of water above the weir crest is known as a) Weir crest b) Weir height c) Backwater d) Freeboard 12. The most common shape of a weir is a) Triangular b) Rectangular c) Trapezoidal d) Circular 13. Which of the following is NOT a type of open channel a) Canal b) Culvert c) River d) Pipe	most suitable for hilly terrain? a) Flood irrigation b) Dip irrigation c) Sprinkler irrigation d) Furrow irrigation 9. Which of the following irrigation methods is most suitable for crops that require frequent watering? a) Flood irrigation b) Dip irrigation c) Sprinkler irrigation d) Furrow irrigation 10. Which of the following is a disadvantage of sprinkler irrigation? a) It leads to waterlogging and soil erosion b) It requires a lot of labor to install
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d) Core 15. Resultant pressure "R" at dam is calculated by - P/W - P.W $\sqrt{P^2 + W^2}$ - P+W 16. Sluice gates are usually made of: - One Metal Wall & I-Beam - Two Metal Walls & I-Beam - Three Metal Walls & I-Beam - One Metal Wall & T-Beam 17. If the resultant pressure of a dam passes within the base then It shows stability against: - Tension failure - Compression failure - Sliding Failure - All of these	d) $d/8$ 15. Loss of head due to sudden enlargement. $(v_1 - v_2)^2/2g$ $0.5v^2/2g$ $0.375v^2/2g$ $V^2/2g$ 16. Loss of head at entrance in the pipe $(v_1 - v_2)^2/2g$ $0.5v^2/2g$ $0.375v^2/2g$ $V^2/2g$ 17. Loss of head due to sudden contraction $(v_1 - v_2)^2/2g$ $0.5v^2/2g$ $0.375v^2/2g$ $V^2/2g$ 18. Loss of head at exit of pipe is give by $(v_1 - v_2)^2/2g$ $0.5v^2/2g$ $0.375v^2/2g$ $V^2/2g$ 19. Major loss of head is due to - Bend	14. What is the hydraulic radius of an open channel? - The ratio of the cross-sectional area to the wetted perimeter - The ratio of the wetted perimeter to the cross-sectional area - The depth of flow - The width of the channel 15. What is the Manning equation used for? - To calculate the discharge of an open channel - To calculate the velocity of flow in an open channel - To calculate the depth of flow in an open channel - To calculate the slope of an open channel	c) It can lead to salt buildup in the soil d) It is not suitable for crops with shallow roots 11. Canals are: - Artificial waterway - Natural waterway - Both above - None of these 12. It is a type of canal: - Lined - Free board - Service - Berm 13. For cutting side slope is taken as: 1.5:1 1:1 1:1 to 1.5:1 1.5:1 to 2:1 14. Banks are provided:
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18. Centre of gravity of volume of liquid displaced is called - Metacentric - Centre of buoyancy - Centroid - Centre of gravity 19. A body is said to be in stable equilibrium When its Centre of gravity lies at the position as compared with its metacenter - Below - Coincides - Above - Any Where 20. The distance between Centre of gravity of a floating body and its metacenter is called as: - Full depth - Full height - Metacentric height - Gravity depth	- Obstruction - Friction - All of These 20. Hydraulic gradient "i" is calculated by hf/l $hfxl$ l/hf f/lh 21. The co-efficient of discharge is the ratio between actual discharge anddischarge - Theoretical - Minimum - Maximum - All 22. Average value of co-efficient of discharge of flowing liquid through orifice is taken as 0.97 0.62 0.67 0.57 23. An orifice is said to be small if available head of water is more	16. Which of the following factors affect the Manning roughness coefficient? - Channel Slope - Channel Roughness - Channel Geometry - All of the above 17. Which of the following is NOT a type of flow in open channels? - Uniform flow - Non-uniform flow - Critical flow - Steady flow 18. What is the Froude number used for? - To determine if flow is subcritical, critical, or supercritical - To determine the velocity of flow in an open channel	- To keep water in a path - To construct service road - Both above - None of these 15. UCC stands for: - Undefined Canal Course - Underlined Canal Course - Upper Chenab Canal - Undefined Chenab Canal 16. Main canal contains the discharge: 5-10 cumecs 0.25-3 cumecs 10 and more than 10 cumecs 7 cumecs 17. Vc stands for:
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21. In case of stable equilibrium metacenter lies at, the position, as compared with Centre of gravity a) Below b) Coincides c) Above d) Any Where 22. Depth of immersion of a floating body is called as a) Toe b) Draught c) Heel d) Buoyancy 23. The resultant upward pressure experienced by a floating body is called a) Viscosity b) Adhesion c) Cohesion d) Buoyancy 24. Metacentric height in meters of a merchant ship is kept as a) 1.5 to 4.5m	than atleast..... times its height. a) 3 b) 5 c) 8 d) 10 24. The continuous stream of a liquid that comes out from an orifice is termed as a) Venacontracta b) Mouth piece c) Jet d) Nappe 25. Ratio between the areas of venacontracta and that of the orifice is termed as co-efficient of a) Contraction b) Velocity c) Discharge d) Energy	c) To determine the depth of flow in an open channel d) To determine the slope of an open channel 19. What is one potential challenge associated with irrigation? a) Reduced soil fertility b) increased water use efficiency c) Reduced crop yields d) Increased water pollution 20. What is the total cultivable area in Pakistan? a) 25 million hectares b) 22 million hectares c) 20 million hectares d) 18 million hectares 21. Which river is the primary source of irrigation water in Pakistan?	a) Controlled velocity b) Critical velocity c) Constant velocity d) None of these 18. It is a condition of silting: a) $V_{act} < V$ b) $V_{act} > V$ c) $V_{act} = V$ d) None of these 19. Minimum bed of canal: a) 1:1000 b) 1:5000 c) 1:8000 d) 1:10000 20. Which fall is suitable for all kind of discharges? a) Ogee b) Sarda c) Inglis d) Straight 21. Aqueduct is a a) Bridge
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- b) 1.00 to 1.5m
- c) 0.30 to 1.00m
- d) 0.00 to 0.30m

25. A floating body has zero metacenter height, it will be in such type of equilibrium

- a) Stable
- b) Unstable
- c) Neutral
- d) Any one

ANSWER KEY

01	(b)
02	(b)
03	(a)
04	(c)
05	(b)
06	(c)
07	(b)
08	(a)

ANSWER KEY

01	(b)
02	(a)
03	(c)
04	(a)
05	(b)
06	(a)
07	(b)
08	(d)
09	(d)
10	(b)
11	(a)
12	(d)
13	(c)
14	(a)
15	(a)

- a) Jhelum River
- b) Sutlej River
- c) Indus River
- d) Ravi River

22. What is the largest dam in Pakistan?

- a) Mangla Dam
- b) Tarbela Dam
- c) Warsak Dam
- d) Hub Dam

23. Which canal is the largest and longest canal in Pakistan?

- a) Sutlej Canal
- b) Chashma Canal
- c) Thal Canal
- d) Nara Canal

24. What is the main crop grown in the irrigated areas of Punjab?

- a) Wheat
- b) Rice
- c) Sugarcane

- b) Canal
- c) Road
- d) Path

22. Crest wall is provided:

- a) Parallel to drain
- b) Across the drain
- c) Incline to drain
- d) All of these

23. If flexibility of an outlet is more than unit, it is called:

- a) Sub proportional outlet
- b) Super proportional outlet
- c) Hyper proportional outlet
- d) None of these

24. Silt drawing capacity of an outlet must be:

- a) 5%
- b) 1%
- c) 7%

09	(d)	16	(b)	d) Cotton	d) 10%
10	(a)	17	(c)	25. Single purpose reservoir is used for	25. is a type of an out let:
11	(a)	18	(d)	a) More than one purpos	a) Non-modular
12	(a)	19	(c)	b) One purpose	b) Flexible
13	(c)	20	(a)	c) One or more than one	c) Rigid
14	(c)	21	(a)	d) Two purposes only	d) All of these
15	(c)	22	(b)	26. is a type of dam based of material	ANSWER KEY
16	(b)	23	(b)	a) Earth filled dam	01 (c)
17	(b)	24	(c)	b) Arch dams	02 (c)
18	(b)	25	(a)	c) Rigid dam	03 (d)
19	(a)			d) Overflow dam	04 (a)
20	(c)			27. Earthen dam is also known as:	05 (c)
21	(c)			a) Gravity dam	06 (d)
22	(b)			b) Rigid dam	07 (b)
23	(d)			c) Embankment dam	08 (c)
24	(c)			d) Detention dam	09 (c)
25	(c)				10 (c)

		28. Pitching prevents _____ in earthen dams. a) Sudden draw down b) Collect the rain water c) Seepage d) Slipping 29. Hydraulic failure occurs nearly _____ %: a) 40 b) 50 c) 30 d) 20 30. Slogging is same as _____ when reservoir is full: a) Overtopping b) Slope failure c) Piping d) For pressure 31. Rising of dam is important for hydro power generation: a) Flood control	11	(a)
			12	(a)
			13	(c)
			14	(c)
			15	(c)
			16	(c)
			17	(b)
			18	(a)
			19	(b)
			20	(c)
			21	(a)
			22	(b)
			23	(c)
			24	(d)
			25	(d)

		b) Increased capacity c) Hydro power generation d) All of these 32. _____ is a type of seepage failure: a) Piping b) Sloughing c) Both above d) Overtopping 33. For construction of head works: a) Path should be narrow b) Side should be accessible c) Bank should be well defined d) All of these 34. Main function of _____ is to provide proper anchorage to floor: a) Cut of b) Downstream apron	
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		c) Inverted filter d) Crest shutters 35. Struts are provided to resist: a) Force b) Thrust c) Friction d) Flow 36. Toe walls are provided at:: a) Upstream side b) Downstream side c) Both above d) Parallel to flow 37. It consists of sand & gravels: a) Sheet pile b) Block protection c) Undersluices d) Inverted filter 38. Adjustable gates are provided for: a) Dam b) Barrage c) Weir d) All of these 39. When water flows over a weir:	
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- a) Its pressure increases
- b) It creates thin sheet of water
- c) Energy reduces
- d) All of these

40. The slope of glacis is:

- a) 4:1
- b) 4:3
- c) 2:3
- d) 3:1

ANSWER KEY

01	(c)
02	(b)
03	(c)
04	(a)
05	(b)
06	(a)
07	(b)
08	(a)

		09	(c)	
		10	(b)	
		11	(c)	
		12	(b)	
		13	(d)	
		14	(a)	
		15	(b)	
		16	(d)	
		17	(d)	
		18	(a)	
		19	(d)	
		20	(b)	
		21	(c)	
		22	(b)	
		23	(d)	
		24	(b)	
		25	(b)	
		26	(a)	
		27	(c)	

Submitted by: Engr. Zeeshan Ali Instructor (P-TEVTA)

		28	(a)	
		09	(a)	
		30	(c)	
		31	(d)	
		32	(c)	
		33	(d)	
		34	(a)	
		35	(b)	
		36	(c)	
		37	(d)	
		38	(b)	
		39	(b)	
		40	(a)	

B. Limited Response Questions

Formative Assessment (Part A)	Formative Assessment (Part B)	Formative Assessment (Part C)	Formative Assessment (Part D)
1. Define the term Hydraulics 2. Enlist the properties of liquids 3. Define the term Specific Weight 4. Define the term Specific Gravity 5. Define the term Viscosity 6. Define intensity of Pressure 7. Define Head of Pressure 8. Define Atmospheric Pressure 9. Define Gauge pressure 10. Define Absolute Pressure 11. Which heavy liquid is used in Manometer? 12. Which liquid is used in Piezometer? 13. What is the specific gravity of Mercury? 14. Define Hydrostatics? 15. Write down the formula to determine Center of Pressure	1. Define the term Hydrokinematics 2. Define Path line 3. Define Streamline 4. Define Potential Line 5. Define Flow Net 6. Define Hydraulic Grade Line] 7. Define Total Energy Line 8. State limitations of Bernoulli's Theorem 9. Write down the practical application of Bernoulli's Theorem 10. Define Total Head 11. Write down the formula of Head 12. Draw sketch of Venturimeter 13. Draw sketch of Pitot Tube 14. Enlist components of Venturimeter	1. Enlist types of Notch. 2. Define Crest of Notch. 3. Define Velocity of Approach. 4. Write down the advantages of V-notch 5. Write down the formula to find discharge through trapezoidal notch 6. Write the formula to find discharge through Stepped notch. 7. Enlist the different types of weirs based on their shapes 8. What are the factors that affect the discharge over a weir 9. Define Weir Coefficient 10. Write down the formula of discharge for Sharp Crested Weir 11. What is the use of Cippoletti Weir?	1. Define the term "command statement" in relation to crop water requirements. 2. What are the factors that influence the calculation of the crop water requirement? 3. Define Duty 4. Define Delta 5. Define Base Period 6. Define Kor Depth 7. Define drip irrigation method 8. Define sprinkler irrigation method 9. Write down the components of sprinkler irrigation method.

acting on an immersed surface 16. Write down the formula to determine Center of Pressure acting on an immersed surface 17. Write down formula to determine Moment of Inertia through centroid of a semi-circle of diameter "d" 18. State conditions of Equilibrium of floating bodies. 19. Define draught. 20. Define Metacentre 21. Define Metacentric height 22. Define Centre of buoyancy. 23. Define Stable Equilibrium 24. Define Unstable Equilibrium 25. State Archimedes' Principle	15. Write down the formula of velocity determination using Pitot Tube. 16. Define Short Pipe 17. Define Long Pipe 18. Enlist the types of minor head loss of flowing liquid 19. State Darcy's formula of major head loss 20. Define hydraulic gradient 21. Classify orifice according to shape 22. Classify orifice according to discharge 23. Define Venacontracta 24. Enlist hydraulic Coefficients 25. State the formula used to find discharge through rectangular orifice	12. Write down the formula for the V-Notch Weir 13. Define Open Channel 14. What is closed conduit? 15. What is the Manning's equation used for in open channel flow? 16. How does the slope of an open channel affect the flow velocity? 17. What is critical depth in open channel flow? 18. What is the best shape for a channel to minimize frictional losses? 19. What is hydraulic jump? 20. State the conditions of most economical trapezoidal channel. 21. What is irrigation? 22. What is the total length of the irrigation canals in Pakistan? 23. What is the percentage of irrigated land in Pakistan? 24. Define Kharif Crop 25. Define Rabi Crop	10. Write down the components of sprinkler irrigation method. 11. Enlist components of canal section. 12. Define freeboard. 13. Define counter berm 14. Enlist main types of canal 15. Define branch canal 16. Enlist types of distributary canal 17. Write the formula of discharge according to Mannings 18. Enlist the name of regimes. 19. Define Trapezoidal notch falls. 20. Enlist necessity of canal fall 21. Define siphon aqueduct. 22. Define super passage. 23. Define flexibility. 24. Define sensitivity. 25. Define efficiency.
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		26. Define multipurpose reservoir. 27. Define storage reservoir. 28. What are main elements for site selection for reservoir? 29. Enlist types of dams based on material. 30. Enlist types of dams based on design. 31. Enlist main components of earthen dam. 32. Enlist types of seepage failure. 33. Enlist types of weir. 34. Define rock fill weir. 35. Define weir breast. 36. Define crest shutters. 37. Define toe wall. 38. What are main types of weir w.r.t shape? 39. What are different parameters of flow of water over weir? 40. Define sheet pile.	
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C . Assessment Tasks

Formative Assessment (Part A)	Formative Assessment (Part B)	Formative Assessment (Part C)	Formative Assessment (Part D)
<u>Assessment Task 1</u> <i>Hydrostatics pressure and center of pressure of vertically immersed surface</i> 1. Gather required equipment & Select immersed surface shapes like Rectangle, Triangle, Square or Circular plates 2. Measure surface dimensions 3. Fill the water tank to desired depth & suspend the immersed surface at varying depths.. 4. Measure pressure using manometers at multiple points. 5. Record pressure values and corresponding depths.	<u>Assessment Task 1</u> <i>Determination of coefficient of discharge using Venturi-meter</i> 1. Prepare required apparatus for observations as per operating manual 2. Measure flow rates using volumetric tank. 3. Determine readings/values by varying discharge using control valve 4. Observe readings through piezometric tubes at inlet and throat 5. Calculate head through piezometer readings	<u>Assessment Task 1</u> <i>Finding the velocity-by-velocity rod and by current meter</i> 1. Select a measurement location 2. Deploy the apparatus in water submerging cups or propeller at full 3. Measure depth of apparatus below water surface 4. Measure velocity using calibration curve 5. Develop table comprising observations & calculations	<u>Assessment Task 1</u> <i>Design and draw a plan showing the general layout of head works of a perennial canal</i> 1. Use of a contour map with respect to canal route 2. Draw alignment of canal, distributary and water course on given scale 3. Prepare design of canal by Kennedy Critical velocity theory 4. Prepare design of canal by Lacey's Regime velocity

6. Measure the distance from the free surface to the centroid (CG) of the immersed surface. 7. Calculate the moment of inertia (I) about CG. 8. Calculate CP coordinates 9. Verify CP location experimentally by applying a force at calculated CP and observing rotational equilibrium. 10. Record observations & calculations	6. Calculate actual and theoretical discharge 7. Calculate coefficient of discharge using formula. 8. Develop table comprising observations & calculations <u>Assessment Task 2</u> <i>Determination of pipe flow losses in pipes</i> 1. Set up the apparatus on the hydraulics bench 2. Fill pipe system and manometer with water by opening valves i.e, check valve, gate valve and flow control valve 3. Set the flow rate at approximately 17 liters/minute 4. Record height readings from all manometers	<u>Assessment Task 2</u> <i>Draw the plan of a multipurpose irrigation project</i> 1. Draw plan of a multipurpose irrigation project 2. Draw plan showing river training and protection works 3. Draw layout of head works 4. Draw weir's section and label it parts 5. Draw plan and section of a silt ejector 6. Label all necessary details	5. Find design parameters. 6. Draw typical X-sections of channels <u>Assessment Task 2</u> <i>Draw the plane and L-section of a masonry flume & Demonstration and drawings of an Aqueduct crossing</i> 1. Identify required hydraulic structure and prepare drawing sheet as per requirement 2. Draw plane and L-section of a masonry flume 3. Prepare drawings of an Aqueduct crossing
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<u>Assessment Task 2</u> <i>Metacentric height of a floating body in lab</i> 1. Fill the tank with water and insert the floating body and ensure that it is in stable equilibrium. 2. Set the horizontal sliding weight to position 'x' from the center towards left side of the vertical bar. 3. Give the model a small angular displacement in clockwise direction. 4. Measure the angle θ in the stable equilibrium. 5. Calculate GM experimentally. Draw a relationship between angle of heel θ(x-axis) and GM (y-	5. Draw hydraulic gradient line. 6. Calculate losses using required formulae 7. Develop table comprising observations & calculations		4. Prepare drawings of a pipe outlet 5. Prepare drawings of adjustable proportional module (A.P.M) Outlet
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axis), then obtain GM when equals zero 6. Plot the metacentric height for different angle of heel and calculate the metacentric height for zero angle of heel. 7. Calculate GM theoretically and compare 8. Record observations & calculations			
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