

Q. In an open channel of wide rectangular section with constant n value, the bed slope is 1.2×10^{-3} , the local friction slope at a section is 1.05×10^{-3} , the local Froude number of the flow is 0.8. The local rate of variation of depth with longitudinal distance along the flow direction is

A. $\frac{1.2-1.05}{1-0.8} \times 10^{-3}$

B. $\frac{-1.2-1.05}{1-0.8} \times 10^{-3}$

C. $\frac{1.2+1.05}{1-0.64} \times 10^{-3}$

D. $\frac{1.2-1.05}{1-0.64} \times 10^{-3}$

Q. A rectangular open channel carries a discharge of $15 \text{ m}^3/\text{s}$ when the depth of flow is 1.5 m and the bed slope is $1 : 1440$. What will be the discharge through the channel at the same depth if the slope would have been $1 : 1$ ODD?

(a) $21.6 \text{ m}^3/\text{s}$

(b) $18 \text{ m}^3/\text{s}$

(c) $14.4 \text{ m}^3/\text{s}$

(d) $12.5 \text{ m}^3/\text{s}$

Q. The height of a hydraulic jump in a stilling pool was found to be 10 cm in a model with $l/l_m = 36$. The prototype jump height would be

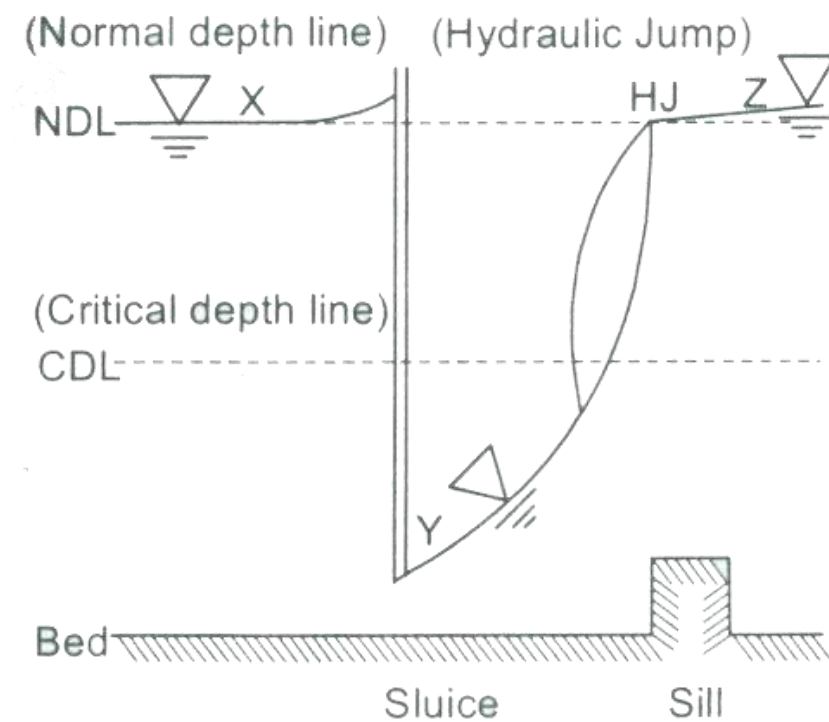
(a) 0.6 m

(b) 3.6 m

(c) 21.6 m

(d) Indeterminable for want of adequate data

Q. A sluice gate opening in a canal is shown in the given figure. The shapes of water surface profiles at X, Y and Z will be respectively.



(a) M1' M3 and M1

(b) M2' M3 and M2

(c) S1' S3 and S2

(d) H2' S3 and S1

Q. The Chezy's coefficient C is related to Darcy-Weisbach friction factor f as

A. $C = \sqrt{(g/8f)}$

B. $C = \sqrt{(8g/f^{1/4})}$

C. $C = \sqrt{(8g/f^{1/4})}$

D. $C = \sqrt{(f/8g)}$

Q. For a hydraulically efficient rectangular section, the ratio of width to normal depth is

(a) 0.5

(b) 1.0

(c) 2.0

(d) $2\sqrt{3}$

Q. Consider the following statements in regard to the critical flow:

- 1. Specific energy is maximum for a given discharge**
- 2. Specific force is maximum for a given specific discharge**
- 3. Discharge is maximum for a given specific force**
- 4. Discharge is maximum for a given specific energy**

Which of these statements are correct?

(a) 1, 2, 3 and 4

(b) 1 and 2

(c) 2 and 3

(d) 3 and 4

Q. The critical depth of water flowing through a rectangular channel of width 5 m when discharge is $12.5 \text{ m}^3/\text{s}$ is

(a) $(2.25)^{1/2} \text{ m}$

(b) $(1.6)^{1/2} \text{ m}$

(c) $(0.46)^{1/3} \text{ m}$

(d) $(0.64)^{1/3} \text{ m}$

Q. For Froude number of a hydraulic jump as 5.5. The jump can be classified as a/an:

- (a) Undular jump**
- (b) Oscillating jump**
- (c) Weak jump**
- (d) Steady jump**

Q. If the Froude number of flow in a rectangular channel at a depth of flow of Y_0 is F_0 then what is Y_c / Y_0 is equal to?

A. $F_0^{1/3}$

B. $F_0^{2/3}$

C. $F_0^{3/2}$

D. None of these

Q. In the step methods (both direct and standard), the computations must

(a) Proceed downstream in subcritical flow

(b) Proceed upstream in subcritical flow

(c) Always proceed upstream

(d) Always start at a control section

Q. Which of the following equations are used for the derivation of the differential equation for water surface profile in open channel flow?

- 1. Continuity Equation**
- 2. Energy Equation**
- 3. Momentum Equation**

Select the correct answer using the code given below:

- | | |
|-------------------------|-------------------------|
| (a) 1, 2 and 3 | (b) Only 1 and 3 |
| (c) Only 1 and 2 | (d) Only 2 and 3 |

Q. In a wide rectangular channel if the normal depth is increased by 20%, then what is the approximate increase in discharge?

(a) 25%

(b) 30%

(c) 35%

(d) 40%

Q. A rectangular channel 3 m wide is laid on a slope of 0.0002. When the depth of flow in the channel is 1.5m, what is the average boundary shear stress (nearly) ?

- (a) 0.3 N/m²**
- (b) 0.15 N/m²**
- (c) 3.0 N/m²**
- (d) 1.5 N/m²**

Q. For a smooth hump in a sub-critical flow to function as a broad crested weir, the height ΔZ of the hump above the bed must satisfy which one of the following?

(a) $\Delta Z \geq (E_1 - Y_c)$

(b) $\Delta Z \leq (E_1 - Y_c)$

(c) $\Delta Z \geq (E_1 - E_c)$

(d) $\Delta Z \leq (E_1 - E_c)$

Q. A hydraulic jump occurs at the toe of a spillway. The depth before jump is 0.2 m. The sequent depth is 3.2 m. What is the energy dissipated in m (approximate) ?

(a) 27

(b) 10.5

(c) 15

(d) 42

Q. In connection with a gradually varied flow with notations Y_0 = normal depth, y_c = critical depth and y = depth in the gradually varied flow. Match List-I with List-II and select the correct answer using the code given below the lists:

| List – I | List – II |
|---|---|
| <p>A. $Y_c > y_0 > y$</p> <p>B. $Y_0 > y > y_c$</p> <p>C. $Y > y_c > y_0$</p> <p>D. $Y > y_0 > y_c$</p> | <p>1. M_1</p> <p>2. S_3</p> <p>3. M_2</p> <p>4. S_1</p> |

Codes

- a. A – 4, B – 1, C – 2, D – 3**
- b. A – 2, B – 3, C – 4, D – 1**
- c. A – 4, B – 3, C – 2, D – 1**
- d. A – 2, B – 1, C – 4, D – 3**

Q. In a wide rectangular channel, an increase in the normal depth to 20% corresponds to how much (approximate) increase in discharge?

- a. 12 %**
- b. 20 %**
- c. 36 %**
- d. 48 %**

Q. Consider the following statements:

Due to aging of pipes in a pipe network

- 1. the roughness increases linearly with time**
- 2. the pipes get rusted and bent**
- 3. the pipes become smoother with time**

Which of the statements given above is/are correct?

- (a) 1 and 3**
- (b) 2 and 3**
- (c) 3 only**
- (d) 1 only**

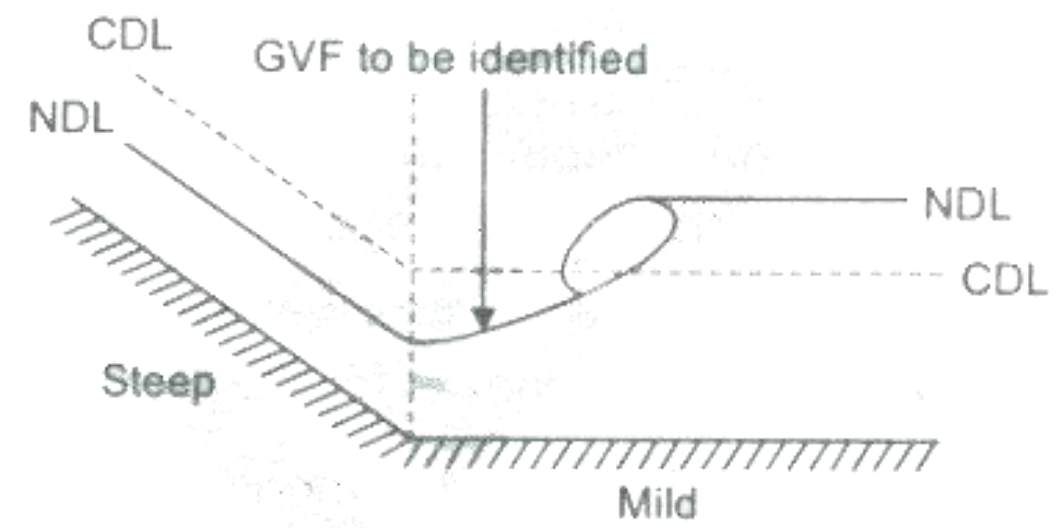
Q. The type of jump that forms when initial Froude number lies between 2.5 and 4.5 is

(a) weak jump

(b) steady jump

(c) undular jump

(d) oscillating jump



Q.

The water surface profile in the flow situation as shown in the figure is :

- a. S_1**
- b. M_3**
- c. S_2**
- d. M_1**

Q. In alluvial channels carrying clear water, the ratio of maximum tractive shear stress on the sides and that on the channel beams approximately

- (a) 0.5**
- (b) 1.76**
- (c) 0.76**
- (d) 1.5**

Q. Consider the following statements in respect of critical flow in a wide rectangular channel:

- 1. The specific energy is minimum for a given discharge.**
- 2. The discharge is maximum for a given specific energy.**
- 3. The specific force is minimum for a given discharge.**
- 4. The Froude number is equal to unity.**

Which of these statements are correct?

- (a) 1,2 and 3 only**
- (b) 1,2, 3 and 4**
- (c) 1,2 and 4 only**
- (d) 2,3 and 4 only**

Q. For a hydraulically efficient rectangular channel of bed width 4.0m, the depth of flow is

(a) 4 m

(b) 0.5 m

(c) 1 m

(d) 2 m

Q. A pumped storage plant is a

(a) high head plant (b) run-off river plant

(c) Peak load plant (d) base load plant

Q. The correct sequence, in the direction of the flow of water for installations in a hydro- power plant is

- (a) Reservoir, surge tank, turbine, penstock**
- (b) Reservoir, penstock, surge tank, turbine**
- (c) Reservoir, penstock, turbine, surge tank**
- (d) Reservoir, surge tank, penstock, turbine**

Q. Match List-I (Type of turbines) with List-II (Ranges of specific speeds in MKS unit) and select the correct answer.

List – I

- A. Francis**
- B. Kaplan**
- C. Pelton with one jet**
- D. Pelton with two jets**

List – II

- 1. 10 – 35**
- 2. 35 – 60**
- 3. 60 – 300**
- 4. 300 - 1000**

Codes

- a. A – 3, B – 4, C – 2, D – 1**
- b. A – 4, B – 3, C – 2, D – 1**
- c. A – 3, B – 4, C – 1, D – 2**
- d. A – 4, B – 3, C – 1, D – 2**

Q. Two identical centrifugal pumps are operated in parallel so as to deliver into a common delivery pipe. Speed for both is also identical. At what total discharge (Q) and total head (H) will the system operate as compared to discharge and head of each of the pumps operated singly?

- 1. Both total Q and total H would increase, each approximately by 50%.**
- 2. Total Q would be approximately doubled, but H would remain the same**
- 3. Total H would be approximately doubled, but Q would remain the same**
- 4. Total H would be doubled, but Q would be approximately halved.**

Q. Storage of water by impounding is required where

A. Plenty of water is available in the stream in all seasons

B. Excess of suspended and dissolved matter are present in the water

C. There is a large variation in quantity of the river flow from time to time

D. The flow is uniform throughout the year but is insufficient

Q. To generate 10,000 HP under a head of 81 m while working at speed of 500 rpm, the turbine of choice would be

(a) Pelton

(b) Kaplan

(c) Bulb

(d) Francis

Q. The maximum permissible suction lift for centrifugal pump in practice (at sea level and at 30°C) is

(a) 12 m

(b) 10 m

(c) 6 m

(d) 3 m

Q. Consider the following statements:

- 1. Pumps in series operation allow the head to increase.**
- 2. Pumps in series operation increase the flow rate.**
- 3. Pumps in parallel operation increase the flow rate.**
- 4. Pumps in parallel operation allow the head to increase.**

Q. Which of these statements are correct?

(a) 1 and 3

(b) 1 and 4

(c) 2 and 4

(d) 3 and 4

Q. Given that atmospheric pressure head = 9 m, vapour pressure head (max.) = 1 m, failure head = 40 m and cavitation coefficient $c = 0.15$, the height at which the turbine can be set above the tail race level is

- (a) 6, m**
- (b) 4 m**
- (c) 3 m**
- (d) 2 m**

Q. If the radius of the centrifugal pump impeller is reduced from 10 cm to 9 cm, the head developed by the pump will change from 10m to

- (a) 9m of water**
- (b) 8.1 m of water**
- (c) 9.487 m of water**
- (d) 11.111 m of water**

Q. Consider the following statements related to centrifugal pumps

- 1. Centrifugal pumps with blades facing backwards have fast runners**
- 2. Multistage pumps have two or more impellers installed in series so that the discharge is increased**
- 3. Diffusion type centrifugal pumps are called turbine pumps**
- 4. A centrifugal pump with rising characteristics is used when actual lift is small and the amount of flow is constant**

Which of these statements are correct?

- (a) 1, 2 and 3**
- (b) 1, 2 and 4**
- (c) 1, 3 and 4**
- (d) 2, 3 and 4**

Q. For a hydro-electric project with reaction turbine, its draft tube at the exit from the turbine is

(A) always immersed in water

(B) always above the water

(C) may either be above or below the water

(D) above or below the water depending on the unit of the turbine

Q. Consider the following statements in case of impulse turbine

(A) always immersed in water

(B) always above the water

(C) may either be above or below the water

(D) above or below the water depending on the unit of the turbine

Q. In case of semi-circular vanes, the theoretical maximum efficiency of the wheel can be?

- a. 50 %**
- b. 67 %**
- c. 75 %**
- d. 100 %**

Q. Which one of the following statements is correct?

- a. Reciprocating pumps are less efficient than centrifugal pumps**
- b. Delivery from a reciprocating pump is pulsating.**
- c. Reciprocating pumps are suitable for large discharges and smaller heads.**
- d. For a negative slip to occur, a reciprocating pump must have a coefficient of discharge less than unity.**

- Q. Pondage in a hydropower station is defined as**
- (a) Impounding of considerable amount of excess water during seasons of surplus flow**
 - (b) A regulating body of water in the form of relatively small amount of run-off to regulate flow variation in daily or weekly power requirements**
 - (c) Excess run-off to last for years**
 - (d) Excess run-off for a few hours only**

Q. The specific speed of a turbine under a head of 150 m to develop 2000 HP while running at 300 r.p.m. is

(a) 10 - 35

(b) 35 - 60

(c) 60 - 300

(d) 300 - 1000

Q. Match List-I (Machines) with List-II (Associated with) and select the correct answer using the codes :

List – I

- A. Centrifugal pump**
- B. Reciprocating pump**
- C. Francis turbine**
- D. Pelton wheel**

List – I

- 1. Percent slip**
- 2. Bucket**
- 3. Guide blade**
- 4. Volute chamber**

Codes

- a. A – 4, B – 3, C – 1, D – 2**
- b. A – 4, B – 1, C – 3, D – 2**
- c. A – 2, B – 3, C – 1, D – 4**
- d. A – 2, B – 1, C – 3, D – 4**

Q. A pelton wheel operates at 630 rpm taking 3 m³/s of water under a head of 256 m with a speed ratio of 0.48. (Given $\sqrt{19.63} = 4.43$). What is the diameter of the impeller?

(a) 0.90 m

(b) 1.03 m

(c) 1.42 m

(d) 1.80m

Q. Which one of the following statements is correct?

A fore bay in a hydel system is provided at the junction of:

- (a) the power channel and the tail race channel**
- (b) the tail race channel and the penstock**
- (c) the penstock and the turbine**
- (d) the power channel and the penstock**

Q. Which one of the following statements is correct?

The function of an air vessel in a reciprocating pump is to obtain:

(a) reduction of suction head

(b) rise in delivery head

(C) continuous supply of water at uniform rate

(d) increase in supply of water

Q. Match List I (Factor) with List II (Ratio) and select the correct answer using the code given below the lists : List – I

List – I

- A. Load factor**
- B. Capacity factor**
- C. Diversity factor**
- D. Plant use factor**

List – II

- 1. Sum of individual maximum demands
Simultaneous maximum demands**
- 2. Maximum demand
Station capacity**
- 3. Average load
Maximum load**
- 4. Energy produced
Installed capacity x time in hours**

Codes

- a. A – 1, B – 2, C – 3, D – 4**
- b. A – 3, B – 4, C – 1, D – 2**
- c. A – 1, B – 4, C – 3, D – 2**
- d. A – 3, B – 2, C – 1, D – 4**

Q. Which one of the following statements is correct?

- (a) Pumps operating in series boost the discharge whereas pumps operating in parallel boost the head**
- (b) Pumps operating in parallel boost the discharge whereas pumps operating in series boost the head**
- (c) In both the above cases there would be a boost in discharge only**
- (d) In both the above cases there would be a boost in head only**

Q. Which one of the following statement is not correct?

- (a) Storage and pond age can be obtained from flow duration curve**
- (b) Primary or firm power corresponds to maximum stream flow condition**
- (c) Secondary power is occasionally called surplus power**
- (d) Often, flash boards are put on dams to augment the pondage at low durations**