EVEREXAM TECH

HYDRAULICS

- FLUID mechanics
- OCF
- Hydraulic machine

Q:) The SI unit of kinematic viscosity is:
(NWDA JE 2019 (12:30 TO 2:30 PM)
HARIYANA SSC 13.04.2018 (AFTERNOON Shift)
(H.P.S.S.C. J.E. 2015)

A : m^3/s^2
B : kg/m-s
C : m^2/s
D : m/s^2

$$\nu = \frac{\mu}{\rho}$$

(C) Correct

1 Stoke = 1 Cm^2/sec

Q:) Which of the below is the desired policy of the manometry fluid?
(NWDA JE 2019 (12:30 to 2:30 PM)

A : Low density
B : Low surface
C : High density
D : High surface tension

Low Vapour Pressure =
Low Viscosity
High chemical Resistant
Low Capillarity
High Density of fluid

(C) Correct

Q:) Which of the following is NOT a characteristic of real fluid?

A : Compressibility
B : Viscosity
C : Surface tension
D : Incompressibility

Ideal Fluid →

(D) Correct

Q:) For a circular water tank of 6 m diameter and 4 m height resting on the ground and having flexible joints between the floor and the wall the maximum hoop tension will be developed at: (Civil ESIC JE. 2019)

A : The bottom edge

B : 1.6 m from the bottom

C : The top edge

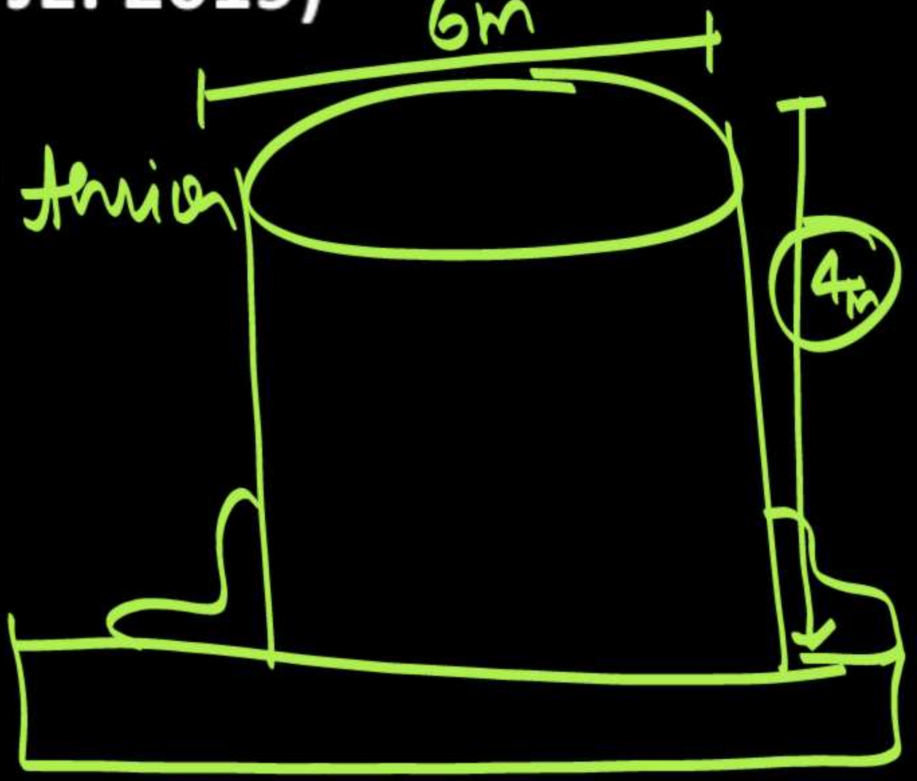
D : 2 m from the bottom

Maximum Hoop tension

$\Rightarrow \frac{\rho H D}{2}$

$\Rightarrow \frac{1000 \times 4 \times 6}{2}$

$\Rightarrow 12000 kg/m^2$



Q:) A jar is filled with a liquid up to the mark of 1 litre and weighed. The weight of the liquid is found to be 5.5 N. The specific gravity of the liquid will be approximately (BSPHCL JE Civil 29.01.2019 (Batch-1)

A : 0.56
B : 0.26
C : 0.66
D : 0.34

Wt. ⇒ 5.5N;

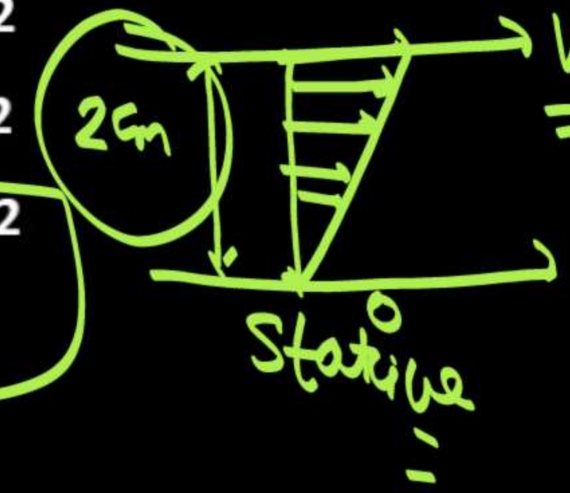
$G \Rightarrow \frac{\gamma_l}{\gamma_w} \Rightarrow \frac{5.5}{1} \Rightarrow 0.56$

(A) Correct

Q:) Two horizontal plates are placed 2cm apart, the space between them being filled with oil of viscosity 10 poise. If the upper plate is moved with a vile city of 2 m/s, the shear stress in the oil would be:
(M.P. Sub Engg. 2 Sep 2018 2.00 pm)

A : 300 N/m²
B : 150 N/m²
C : 200 N/m²
D : 100 N/m²

10 Poise = 1 $N s/m^2$ ($= \mu$)



$\tau = \mu \cdot \frac{dv}{dy}$

$= \tau = 1 \times \frac{(2-0)}{0.02}$

$\Rightarrow 100 N/m^2$

Q:) Match list I with II and choose the correct answer from the options given below: (L.M.R.C. J.E. 2015)

List-I (Physical quantity)	List-II (Dimension)
A. Angular velocity	a. L^2T^{-1}
B. Angular acceleration	b. T^{-1}
C. Discharge	c. T^{-2}
D. Kinematic	d. L^3T^{-1}

A : (a) A-a, B-b, C-d,D-a

B : (b) A-b, B-c, C-d, D-a

C : (c) A-c, B-d,C-a, D-b

D : (d) A-b, B-d. C-a, D-c

B Correct

T^{-1} rad/sec

rad/sec^2

T^{-2}

m^3/sec

L^3T^{-1}

Q:) Which of the following fluids can be classified as non-newtonian?
(L.M.R.C. J.E. 2015/SSC JE 2 MARCH 2017 Morning Sift)(ESE 2003)

(B) Correct

A : Kerosene oil and Diesel oil

B : Human blood and Toothpaste

C : Diesel oil and water

D : Kerosene oil and water

Q:) Match List-I with List-II and choose the correct answer from the options below. (UPPCL JE, 2015)

List-I (Fluid property)	List-II (Flow phenomenon)
A. Compressibility	a. Flow of real fluid past a tiny sphere
B. Gravity	b. Cavitation
C. Viscosity	c. Hydraulic jump
D. Vapour pressure	d. Flight of supersonic

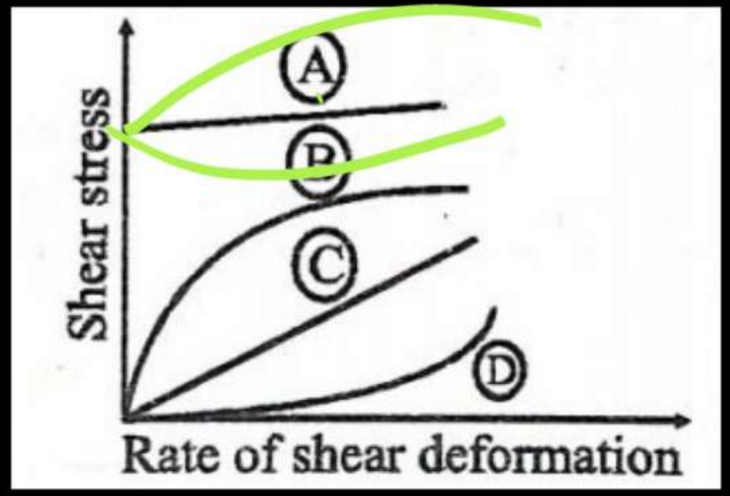
A : A-c, B-d, C-b, D-a

B : A-c, B-d, C-a, D-b

C : A-d, B-c, C-a, D-b

D : A-d, B-c, C-b, D-a

Q:) In the given figure which nature of fluid is represented by curve A? (UPPCL JE, 2015 ESE 2010)



(D) Correct

A : Newtonian

B : Psedo-plastic

C : Dilatant

D : Ideal Bingham plastic

D – Dilatant Fluid

C – Newtonian

B – Pseudoplastic

A → ideal Plastic or Bingham Plastic

Q:) When a force is exerted by a flowing fluid on a stationary body, the component of the total force in the direction perpendicular to the direction of motion is known as (BSPHCL JE Civil 29.01.2019 (Batch-2)

A : Drag
B : Lift
C : Shear
D : Stress

(B) Correct

$F_L = \frac{1}{2} C_L \rho A V^2$

$F_D = \frac{1}{2} C_D \rho A V^2$

A → Planform area

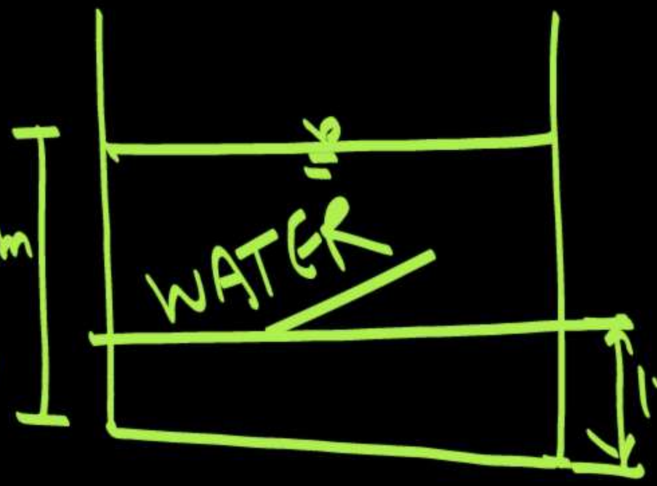
Q:) If a storage tank, which is completely full, contains 11.3 m height of water, what pressure would a pressure gouge read, that is located 1.5 m above the bottom of the tank? (BSPHCL JE Civil 29.01.2019 (Batch-2)

A : 9.81 kPa

B : 9.61 kPa

C : 96.1 kPa

D : 10.9 kPa



$P = \gamma \times h$

$P = 9.81 \times (11.3 - 1.5)$

$P = 96.1 \text{ kPa}$

(C) Correct

Q:) For a floating body to be in stable equilibrium, its metacenter should be- (Rajasthan PSC 2018)

A : Below the centre of gravity
B : Below the center of buoyancy
C : Above the center of buoyancy
D : Above the centre of gravity

(D)

Submerged Body:-

⇒ G Below B ⇒ Stable

⇒ G above B ⇒ Unstable

⇒ G at B ⇒ Neutral equillibrium

Floating Body:-

M above G ⇒ Stable (GM > 0)

M Below G ⇒ Unstable (GM < 0)

M at G ⇒ Neutral = (GM = 0)

Q:) Condition of stable equilibrium of submerged body:
(LMRC J.E. 13.05.2018 (Shift-I)

(A) Correct

A : Weight of body is equal to buoyancy force & buoyancy point is above the center of gravity

B : Buoyancy force should be in between the center of gravity and buoyancy point

C : Buoyancy force should be below the center of gravity

D : Buoyancy force coincide with center of gravity

Q:) Pressure of 10 m of head of oil, having specific gravity 0.90 is equal to:
(SSB Himachal Pradesh 18.11.2018)

A : 90.00 kN/m²
B : 88.29 kN/m²
C : 1000 kg/m²
D : 882.9 kg/m²

(B) Correct

Pressure = ρgh

$\Rightarrow 0.90 \times 1000 \times 9.81 \times 10$

$P \Rightarrow 89.29 \text{ kN/m}^2$

Q:) The pressure at a point 4m below the free surface of water is (SJVL JE 07-10-2018)

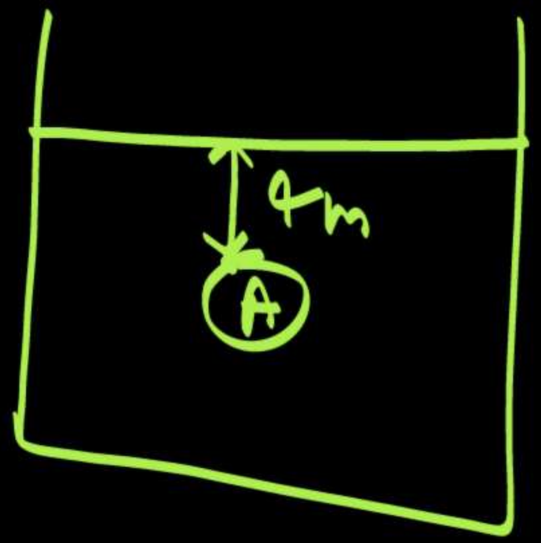
A : 19.24 kPa

B : 29.24 kPa

C : 39.24 kPa

D : 49.24 kPa

Option © Correct



$P_A = \rho g h$

$= 9.81 \times 4$

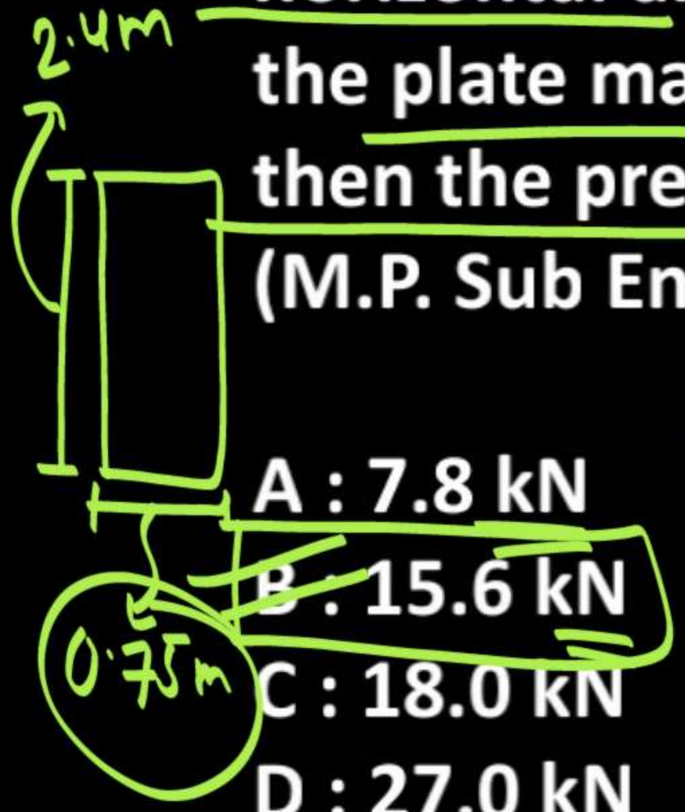
$= 39.24 \text{ kPa}$

Q:) In the stability of floating bodies, the stable equilibrium is attained if the meta centre (M) point ____ the centre of gravity (G)
(DFCCIL Civil JE 10-11-2018)

A : Lies below
B : Coincides with
C : lies above
D : Is parallel to

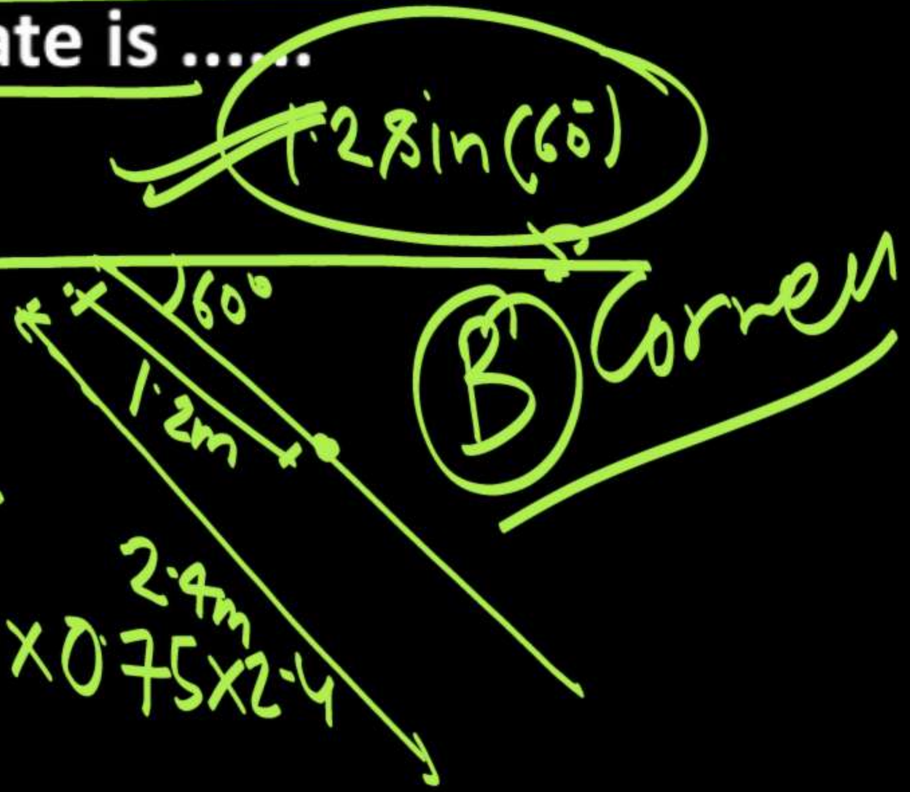
(C) Correct

Q:) A rectangular plate 0.75 m X 2.4m is immersed in a liquid or relative density of 0.85 with its 0.75 m side horizontal and just at the water surface. If the plane of the plate makes an angle of 60^0 with the horizontal, then the pressure on one side of the plate is .....
(M.P. Sub Engg. 4 Sep 2018 2.00 pm)



A : 7.8 kN
B : 15.6 kN
C : 18.0 kN
D : 27.0 kN

Force On Plate
⇒ Pressure at x area of the c.g of Plate Plate
⇒ $0.85 \times 1000 \times 9.81 \times 1.2 \sin(60^\circ) \times 0.75 \times 2.4$
⇒ 15.6 kN



Q:) The reading on the pressure gauge filter on a vessel is 34 bar. The atmospheric is 1.03 bar and value of g is 9.81 m/s^2.The absolute pressure in the vessel is-
(NWDA JE 2019 (12:30 to 2:30 PM)

A : 23.98 bar
B : 33.03 bar
C : 35.03 bar
D : 32.97 bar

Absolute Pressure = (P_{abs}) = $P_{atm} + P_{gauge}$

$P_{abs} = 34 + 1.03$

$P_{abs} = 35.03$ Bar

Option C

Q:) The energy loss in case of ~~centimeter~~ Venturimeter when compared to orifice meter is- (UPRVUNL JE 2019)

A : Same

B : Depends on type of liquid

C : More

D : Less

Venturimeter

$C_d = 0.95$ to 0.99

(D) Correct

Orifice meter

$C_d = 0.61 - 0.62$

Q:) From the following assumption made in the derivation of Bernoulli's equation is incorrect.
(Hariyana SSC JE Shift-I (11.04.2018)

A : The fluid is ideal

B : The flow is unsteady

C : The flow is incompressible

D : The floe is ~~irrigational~~ irrotational

(B) Incorrect

Energy / mass ⇒ every term

⇒ along a single streamline + steady

Energy / weight

Q:) The frictional resistance for turbulent flow is-
(Hariyana SSC JE Shift-I (11.04.2018)

A : Proportional to the density of fluid

A Correct

B : Dependent of pressure

C : Independent to the area of surface in contact

D : Independent to the nature of surface

frictional resistance (↑) Density (↑)

Q:) If R is the 'hydraulic mean radius' and D is the depth of water, the section of canal will be most economical when_____. (Civil ESIC JE 2019)

A: D = R/2

B: None of the given options

C: R = D/2

D: D = R

$R = \frac{A}{P} \Rightarrow \frac{\frac{\pi}{4}D^2}{\pi D}$

$R = \frac{D}{4}$

(B) Correct

most efficient → circular

Q:) What is the turbulent shear stress according to Prandt' mixing length theory? (Civil ESIC JE 2019)

A : $p\ell\left(\frac{du}{dy}\right)$

B : $p^2\ell^2\left(\frac{du}{dy}\right)^2$

C : $p\ell\left(\frac{du}{dy}\right)^2$

D : $p\ell^2\left(\frac{du}{dy}\right)^2$

$\tau_{turbulent} \Rightarrow \rho\, l_x\, l_y$

$l_x \Rightarrow l \times \frac{du}{dy}$; $l_y \Rightarrow l \times \frac{du}{dy}$

Mixing length

$\tau_{turbulent} \Rightarrow \rho\, l \cdot \frac{du}{dy} \times l \times \frac{du}{dy}$

$\tau_{turbulent} \Rightarrow \rho\, l^2 \left(\frac{du}{dy}\right)^2$

(D) Correct

Karman const $\Rightarrow l \Rightarrow K y \Rightarrow K = 0.4$

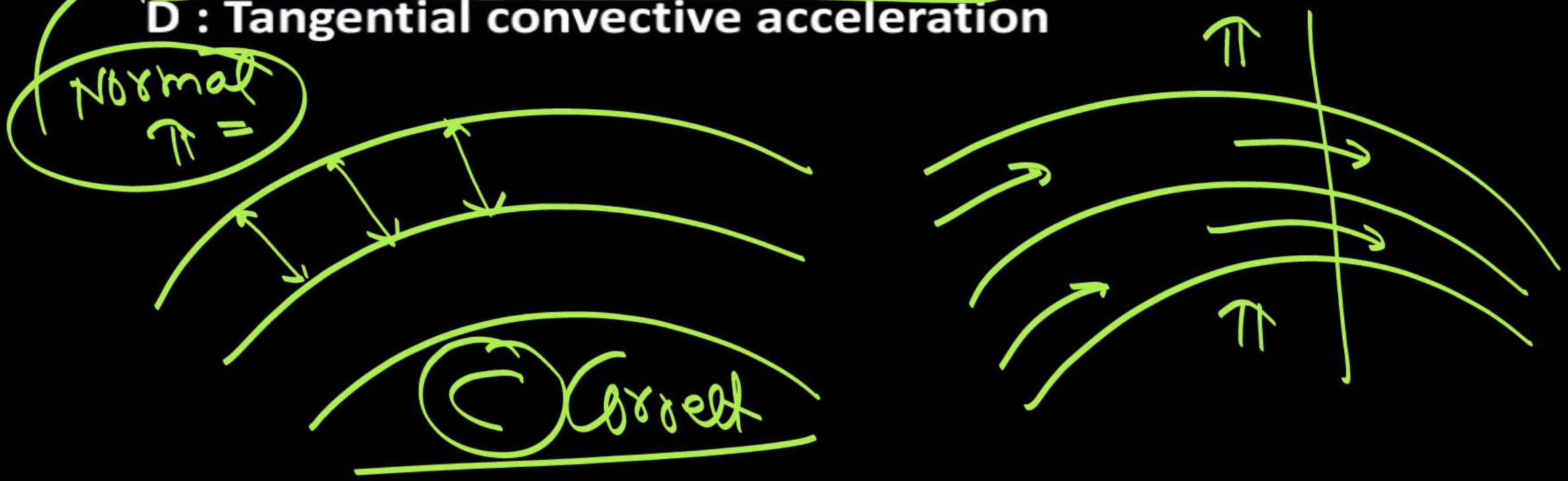
Q:) The flow in which parallel curved stream lines are steady has: (Civil ESIC JE 2019)

A : Local acceleration

B : Normal convective as well as local acceleration

C : Normal convective acceleration

D : Tangential convective acceleration



Q:) Bernoulli's equation is applicable between any two points: (Civil ESIC JE 2019)

A : In steady rotational flow of an incompressible fluid

B : In any type of irrigational flow of a fluid

C : In any rotation flow of an incompressible fluid

D : In steady irrigational flow of an incompressible

is rotational

(D) Correct

Q:) For a flow, the velocity field and variation in density is given as, $\bar{V} = (10x + 3y + 2z)\hat{i} + (12x + 4y + 5z)\hat{j} + (8x + 7y + \lambda z)\hat{k}$ and $\rho = \rho_0 e^{-3t}$ respectively. What is the value of λ, if the mass is conserved? (SSC JE 29-01-2018 (Evening shift)

(B) Correct

A : -10

B : -11

C : 10

D : 11

Continuity eqn :

$$\frac{\partial \rho}{\partial t} + \frac{\partial(\rho u)}{\partial x} + \frac{\partial(\rho v)}{\partial y} + \frac{\partial(\rho w)}{\partial z} = 0$$

Steady

$\rho = \rho_0 e^{-3t}$

$(-3)\rho_0 e^{-3t} + \rho\left[\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z}\right] = 0$

$u = 10$, $v = 4$, $w = \lambda$

$\rho\{-3 + 10 + 4 + \lambda\} = 0$

$\lambda = -11$

Q:) If velocity potential exists, the flow should be
(Hariyana SSC 13-04-2018)

A : Rotational
B : Laminar
C : Turbulent
D : Irrigational

(D) Correct

$(\phi) \rightarrow (*)$ Irrotational

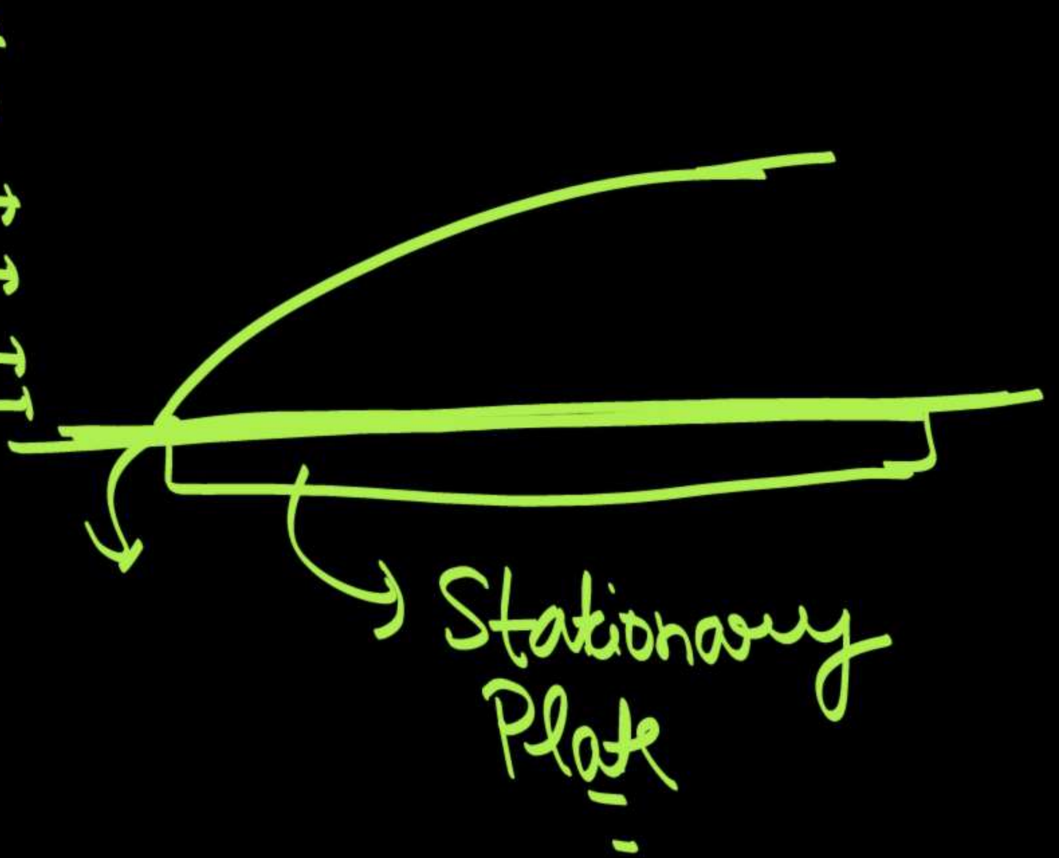
$$\frac{\partial \phi}{\partial x} = -u$$

$$\frac{\partial \phi}{\partial y} = -v$$

Q:) Preston tube is used to measure.
(DDA JE 23.04.2018, 12:30-2:30 pm)

A : Boundary layer viscosity
B : Boundary shear stress
C : Mean flow velocity
D : Turbulent velocity profile

(B) Correct



Q:) For a laminar flow, what is the ratio average velocity and maximum velocity- (DMRC JE 16-02-2017 1st Shift)

A : 1
B : 0.66
C : 2
~~D : 0.5~~

(D) Correct

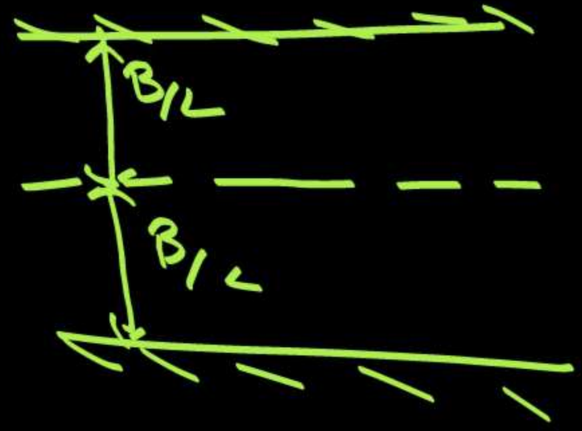
Pipe

$V_{avg} = \frac{V_{max}}{2}$

$r = 0.707R$

Plate

$V_{avg} = \frac{2}{3} V_{max}$



$\frac{B}{2} \pm \frac{B}{2\sqrt{3}}$

$y = 0.223R$ = Turbulent flow

Q:) For a two dimensional flow, the stream function is given by $\psi = 2xy$. the velocity at a point (3,4) is equal to- (UTTRAKHAND AE 2013)

A : 6m/sec

B : 8m/sec

C : 10 m/sec

D : 12 m/sec

$\psi = 2xy$ Point $(3, 4)$

$\frac{\partial \psi}{\partial x} = +v = 2y = 8$

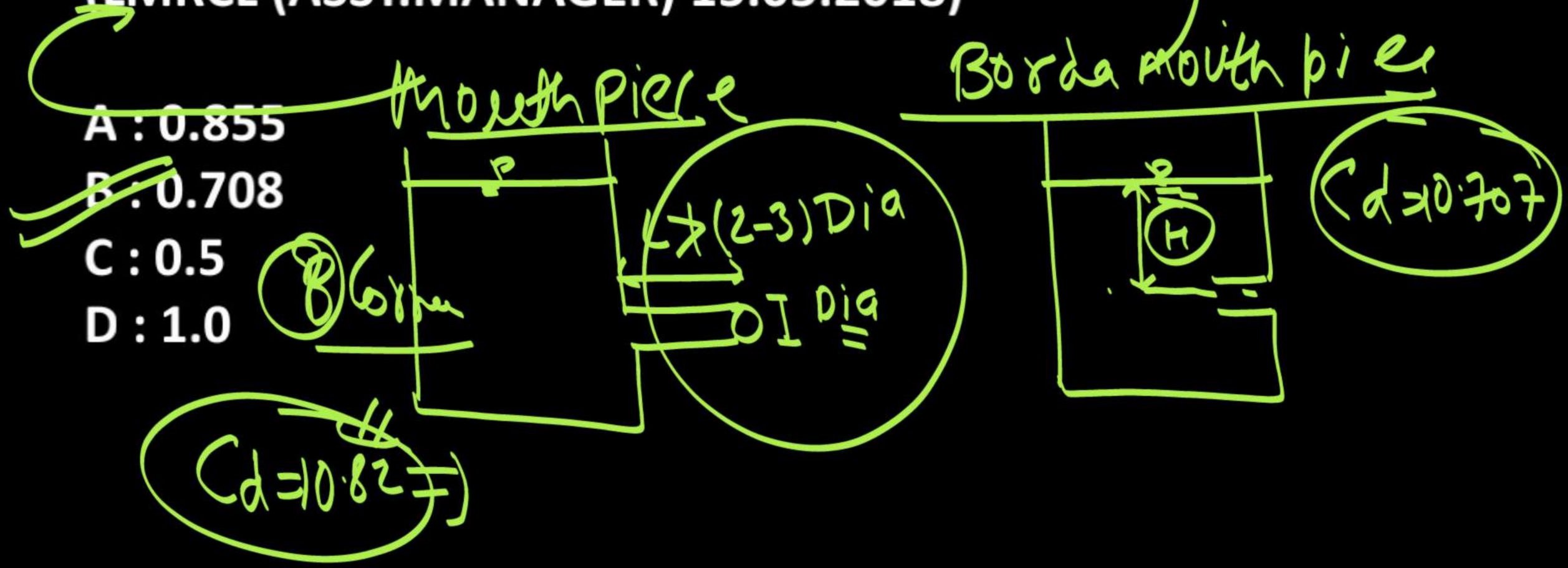
$\frac{\partial \psi}{\partial y} = -u = +2x = 6$

$V = \sqrt{v^2 + u^2}$

$V = \sqrt{8^2 + 6^2} = 10 m/s$

Q:) The coefficient of discharge (C_d) for internal mouthpiece, which is running full, is:
(LMRCL (ASST.MANAGER) 15.05.2018)

A : 0.855
B : 0.708
C : 0.5
D : 1.0



Q:) If time taken (T) to close the valve is less 2L/C then the valve closure is said to be:
(LMRCL (ASST. MANAGER) 15.05.2018)

A : Sudden
B : Gradual
C : Leakage
D : Water tight

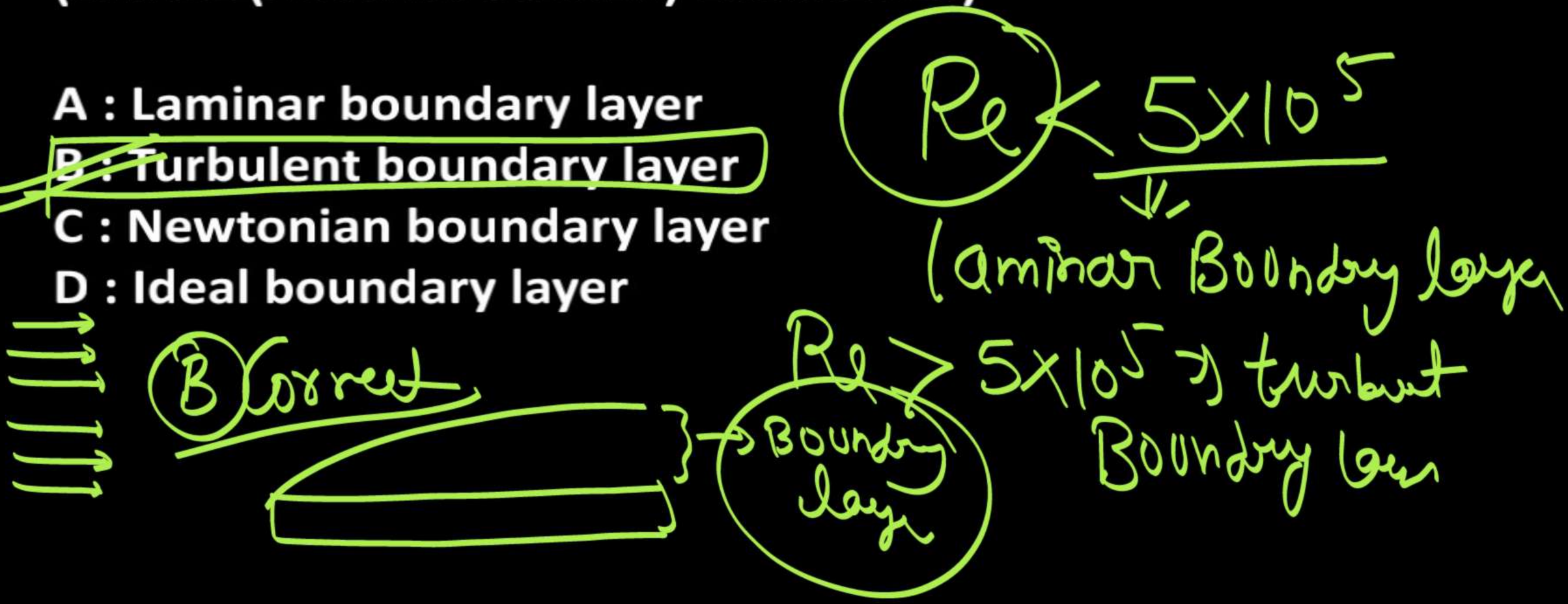
A) $T < \frac{2L}{C}$ ⇒ Sudden closure

$T > \frac{2L}{C}$ ⇒ Rapidid closure

Critical time of closure $(T_C) = \frac{2L}{C}$

Q:) If the Reynold number is more than 5×10^5, the boundary layer is called as:
(LMRCL (ASST. MANAGER) 15.05.2018)

A : Laminar boundary layer
B : Turbulent boundary layer
C : Newtonian boundary layer
D : Ideal boundary layer



Q:) For turbulent flow through rough pipe, the factor Re√f/(R/k)is (Notation have their usual meaning)- (UTTRAKHAND AE 2013)

A : <16

B : >400

C : >70

D : p<70

(B) Correct

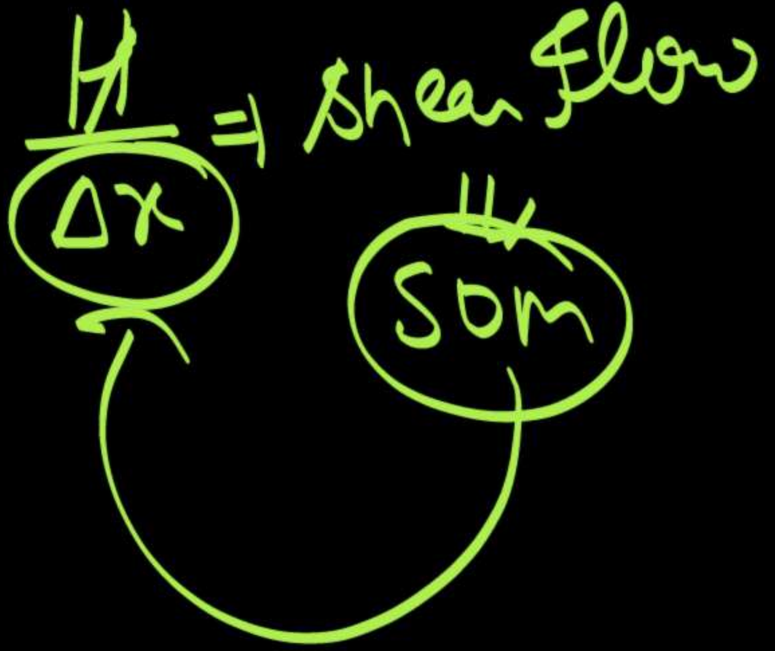
$\frac{Re\sqrt{f}}{R/k} < 17 \Rightarrow$ HydroDynamically Smooth Pipe

$\frac{Re\sqrt{f}}{R/k} > 400 \Rightarrow$ HydroDynamically Rough Pipe

Q:) The shear flow in a section can be defined as:
(BCCL JE 30 April 2017)

A : Total shear stress
B : Total shear stress at a point
C : Direction of the shear stress
D : None of these

B



Q:) If the bed slope of the channel does not change along the length, it is called as-
(Hariyana SSC JE Shift-I (10.04.2018))

A : Rigid Boundary
B : Natural channel
C : Collette channel
D : Prismatic channel

(D) Correct

Q:) The flow in open channel is said to be laminar if the Reynolds number is less than-
(Hariyana SSc JE Afternoon session (11.04.2018)

A : 2000
B : 500 or 600
C : 4000
D : 2000 or 4000

(B) 500

$Re < 500 \rightarrow$ laminar

$500 < Re < 2000 \rightarrow$ transition

$Re > 2000 \rightarrow$ turbulent flow

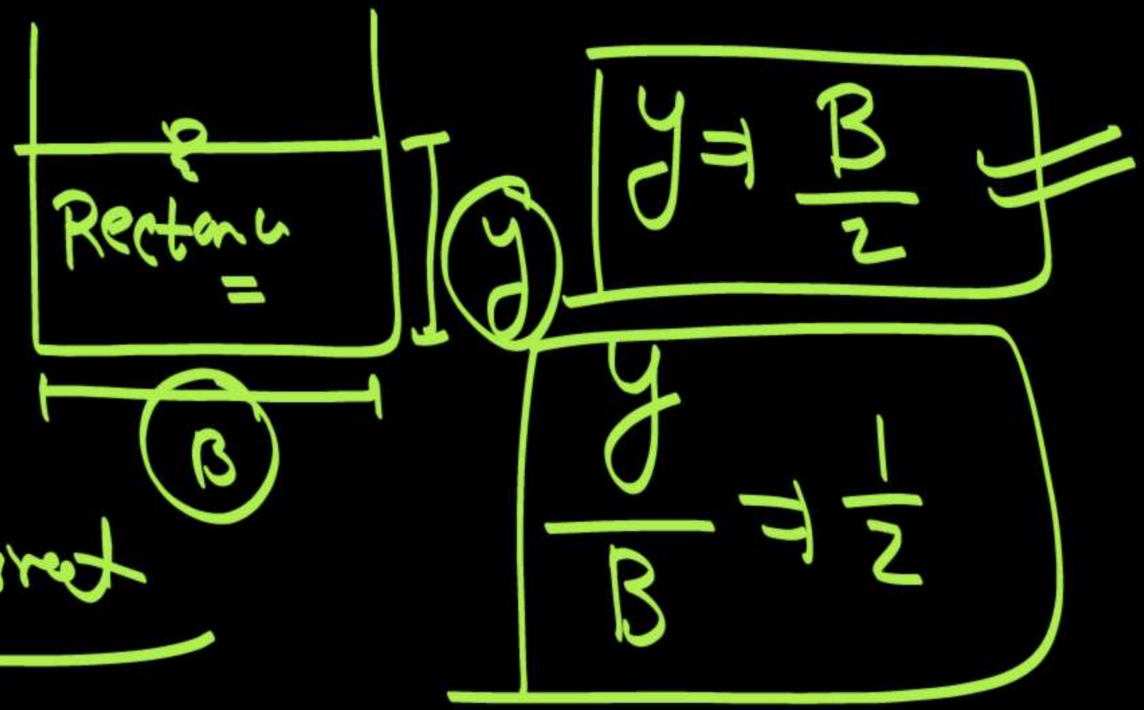
Q:) A rectangular channel section is most economical when the depth of flow and bottom width is in the ratio of..... (M.P. Sub Engg. 2 Sep 2018 2.00 pm)

A : 2:1

B : 1:1

C : 1:2

D : 1:4



C Correct

Hydraulic Radius

$R = \frac{y}{2}$

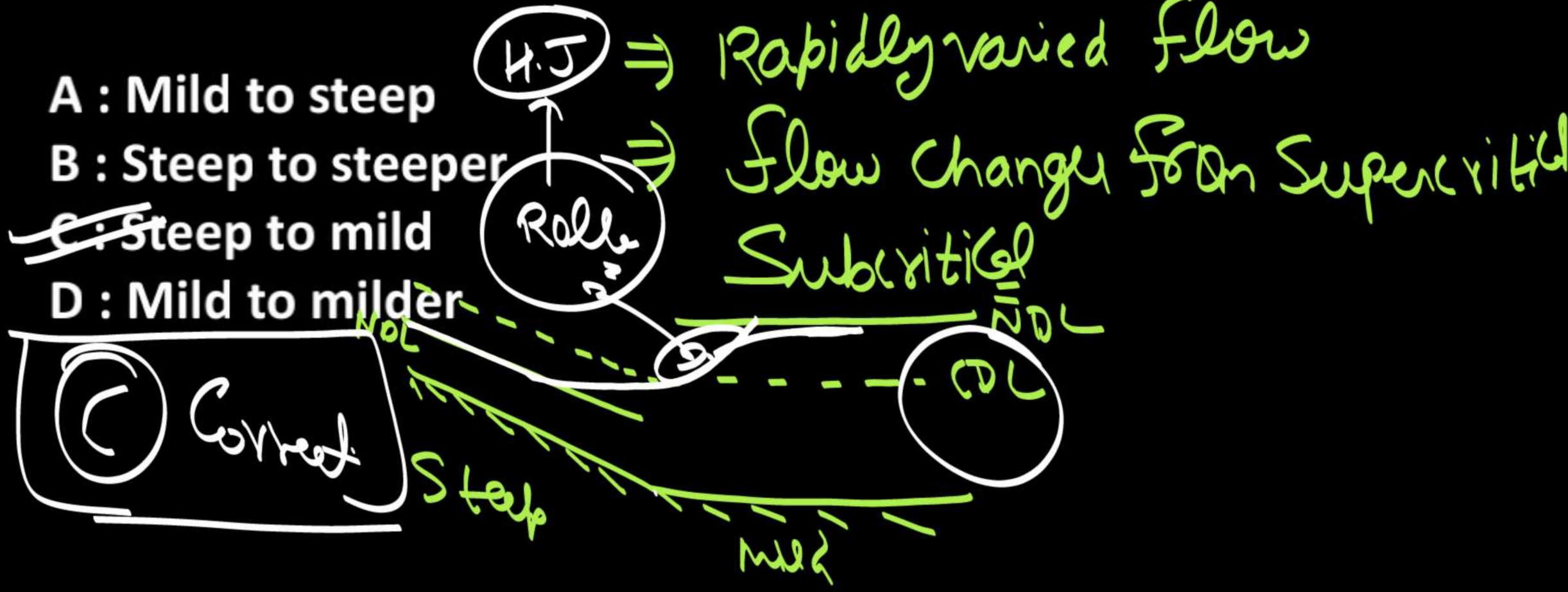
Q:) A hydraulic jump occurs when the grade changes from: (DDA 24.04.2018 (First Shift)

A : Mild to steep

B : Steep to steeper

~~C : Steep to mild~~

D : Mild to milder



Q:) Hydraulic jump occur flow changes from
(U.K. combined A E paper II 2012)

A : Super critical to sub-critical
B : Sub-critical to super critical
C : Critical to super-critical
D : Laminar to turbulent

(A) Correct

Q:) The unit speed N_u of a turbine of rotational speed N and head is equal to: (Civil ESIC JE 2019)

A : nVH

~~B : N/√H~~

C : √H/N

D : √HN

Unit Speed $N_u = \frac{N}{\sqrt{H}}$

Unit Discharge $Q_u = \frac{Q}{\sqrt{H}}$

for Hydraulic Machine :- (Model law)

$N_S = \frac{N\sqrt{P}}{H^{5/4}}$

$\frac{Q}{ND^3} =$ Constant

$\frac{P}{\rho N^3 D^5} =$ Constant

$\frac{gH}{N^2D^2} =$ Constant

$\frac{N_1D_1}{\sqrt{H_1}} = \frac{N_2D_2}{\sqrt{H_2}}$

Turbine

$N_S = \frac{N\sqrt{Q}}{H^{3/4}}$

Pump

Q:) Which of the following is the dimensional formula for the specific speed of a turbine?
(RRB JE CBT-II 28-08-2019 (morning)

(B)

A : $M^{\frac{1}{2}} L^{\frac{1}{4}} T^{\frac{-3}{2}}$

B : $M^{\frac{1}{2}} L^{\frac{-1}{4}} T^{\frac{-5}{2}}$

C : $L^{\frac{3}{4}} T^{\frac{-2}{2}}$

D : $M^{\frac{1}{2}} L^{\frac{-3}{4}} T^{\frac{-5}{2}}$

$$N_S = \frac{N\sqrt{P}}{H^{5/4}}$$

$$N_S = \frac{[T^{-1}]\,[ML^2T^{-3}]^{1/2}}{M^{1/2}L^{-1/4}T^{-5/2}\,(L)^{5/4}}$$

Q:) The speed of a turbine, working under unit head, is given by: (DMRC 18.04.2018 4.30 Pm)

A : $\frac{N}{\sqrt{H}}$

B : $\frac{N}{H^3}$

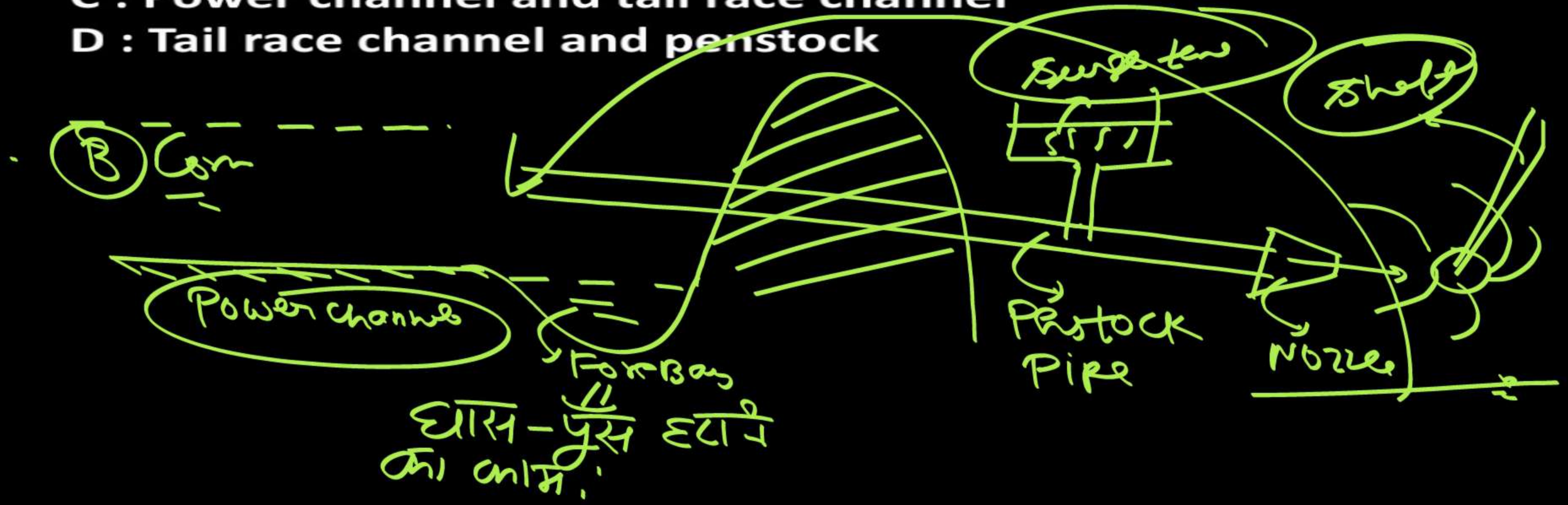
C : $\frac{N}{H}$

D : $\frac{N}{H^{\frac{3}{2}}}$

(A) Correct

Q:) In the hydel system, a for eBay is used at the unction of .....
(SSC JE 29-01-2018 (Morning Shift) (ESE 2005)

A : Penstock and turbine
B : Power channel and penstock
C : Power channel and tail race channel
D : Tail race channel and penstock



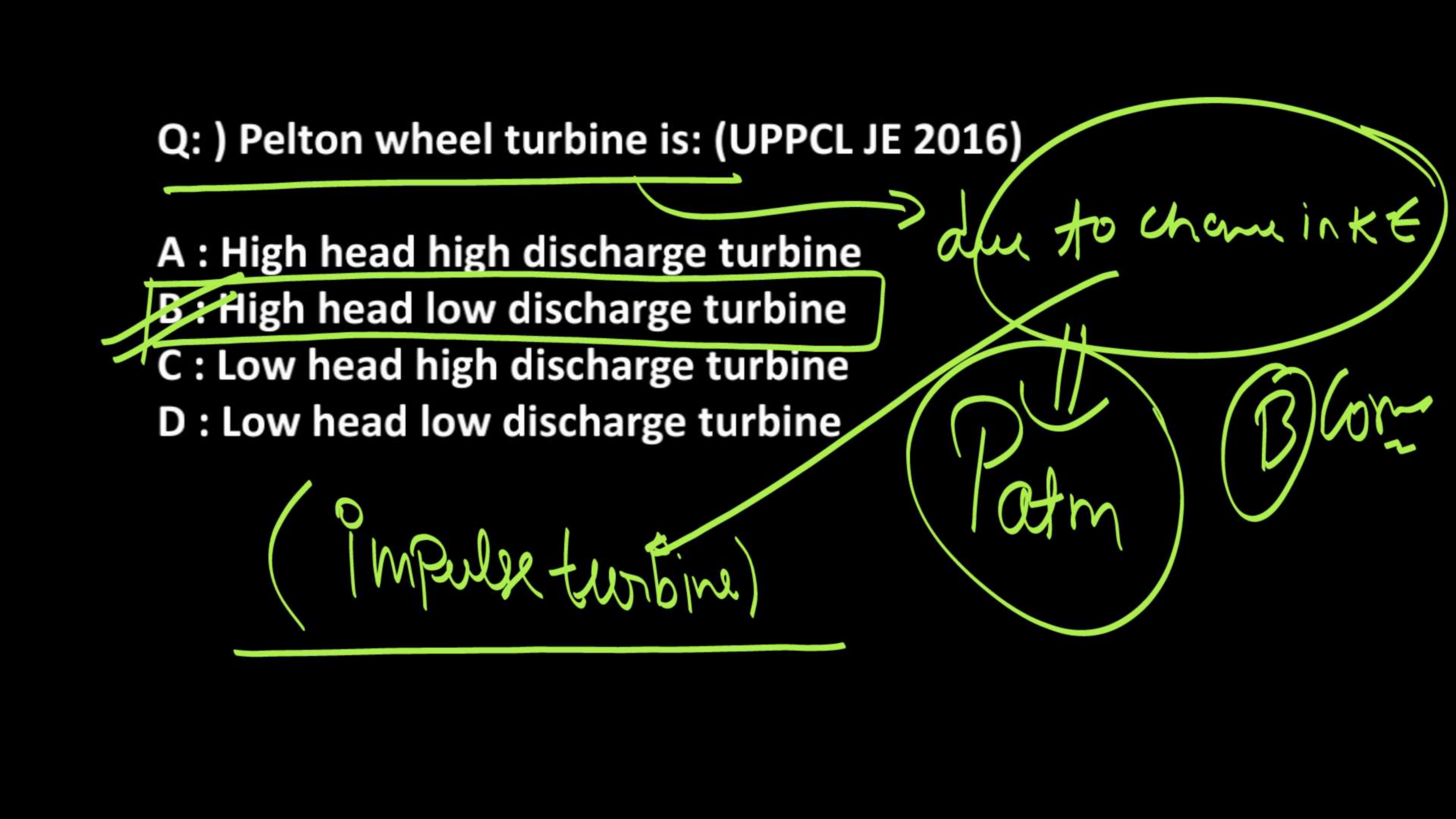
Q:) Pelton wheel turbine is: (UPPCL JE 2016)

A : High head high discharge turbine

B : High head low discharge turbine

C : Low head high discharge turbine

D : Low head low discharge turbine



Q:) Slip of a reciprocating pump is defined as the (UPRVUNL JE 2015)

→ Low Discharge at High Head (20-30 kg/cm²)

Close

A : Ratio of actual discharge to the theoretical discharge

B : Sum of actual discharge and the theoretical discharge

C : Difference of theoretical discharge and the actual discharge

D : Product of theoretical discharge and the actual discharge

$Q_{th} = \frac{ALN}{60}$ m³/s

Slip = $Q_{th} - Q_{actual}$

Q:) A turbine works at 20 m head and 500 rpm speed. Its 1 : 2 scale model to be tested at a head of 20 m should have a rotational speed of nearly.
(L.M.R.C. JE 2015)

Turbine : Model

A : 1000 rpm

B : 700 rpm

C : 500 rpm

D : 250 rpm

$\frac{D_m}{D_p}$ $N_1 = 500$ rpm. $N_2 = ?$

$L_r = \frac{L_m}{L_p} = \frac{1}{2} = \frac{D_1}{D_m}$

$\frac{N_P D_p}{\sqrt{H_1}} = \frac{N_m D_m}{\sqrt{H_2}}$

$N_m = N_P \times \left(\frac{D_P}{D_m}\right) = 250 \times 2 = 500$ rpm

$N_M = N_P \times \left(\frac{D_1}{D_2}\right)$

A. Correct

$L_r = \frac{L_m}{L_p} = \frac{1}{2} = \frac{D_m}{D_p}$

$\frac{N_m D_m}{\sqrt{H_m}} = \frac{N_P D_p}{\sqrt{H_p}}$

$N_m = N_P \times \left(\frac{D_p}{D_m}\right)$ → 2

$N_m = 500 \times 2 = 1000$ rpm

$\frac{D_p}{D_m} = 2$

Q:) The specific speed of a pump has dimensions of (SSC JE 2007)

A : $L^{3/4}T-3/2$

B : $L^{3/4}T-1/2$

C : $M^oL^oT^o$

D : $M^{-1/2}L^{1/2}T-1/4$

A

$N_S = \frac{N\sqrt{Q}}{H_m^{3/4}}$

$Q = \frac{m^3}{sec} = \frac{L^3}{T}$

$\Rightarrow \frac{[T^{-1}][L^3/T]^{1/2}}{L^{3/4}}$

$L^{3/4}T^{-3/2}$

Q:) Assertion A: The inlet velocity triangle for a Pelton turbine is a straight line.

Reason R: For a Pelton turbine, the vane angle at inlet is 180^0.

Which of the following is correct?

(L.M.R.C. J.E. 2015)

$V = V_w$

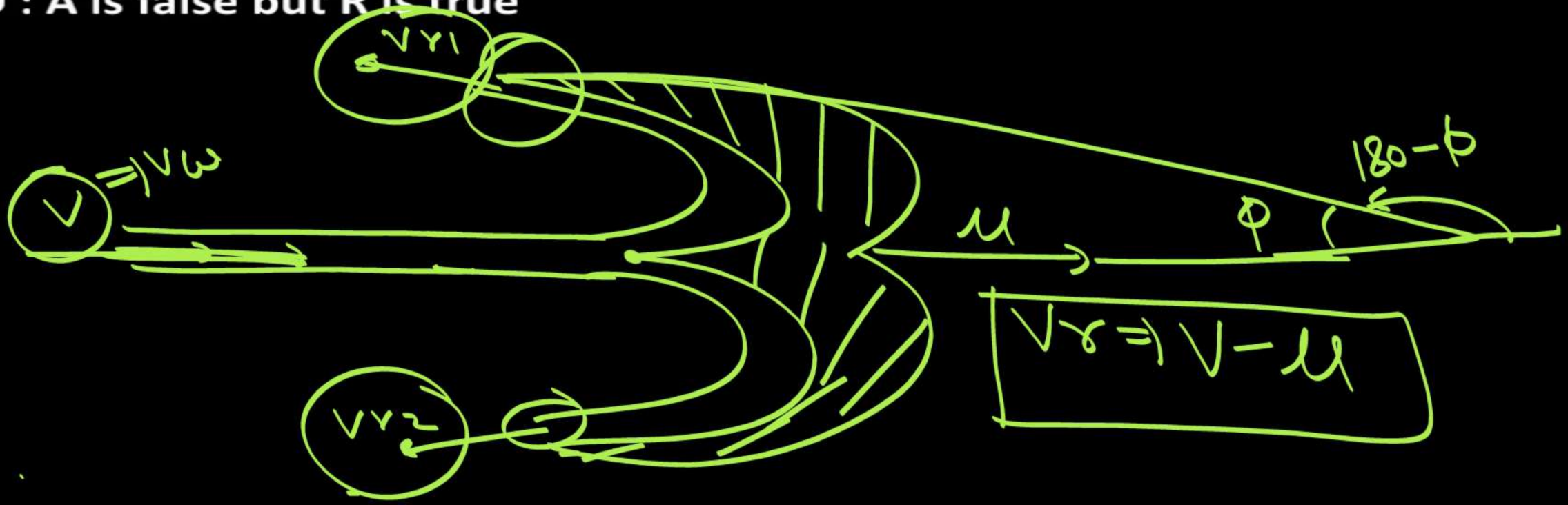
(A) Correct

A : Both A and R true and R is the correct explanation of A

B : Both A and R true but R is not the correct explanation of A

C : A is true but R is false

D : A is false but R is true



Q:) A penstock pipe of 10 m diameter carries water under a pressure head of 100 m. If the well thickness is 9 mm. What is the tensile stress, in Mpa, in the pipe wall? (UPPCL JE, 2015)

A : 1090
B : 272.5
C : 2725
D : 545.0

Ⓓ Correct

$\sigma = \frac{pd}{2t} = \frac{9810 \times 100 \times 10}{2 \times 0.009}$

$\sigma = 545\ N/m^2$

Q:) The removal of air by filling the pump with water is called (Uttara hand JE paper II 2015)

A : Priming

B : De-aerating

C : Sterilizing

D : None of the above

Q:) When two centrifugal pumps are operated in series, the discharge (Uttara hand JE paper II 2015)

A : Increases

B : Decreases

C : Remains constant

D : Initially increases, then decreases

Q Correct

Series

Q - Constant

$h_L = h_{L_1} + h_{L_2} + \cdots$

Parallel

$h_{L_1} = h_{L_2} = h_{L_3}$

$Q = Q_1 + Q_2 \cdots$

2500+

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