MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION
(Autonomous)
(ISO/IEC-270001 – 2005 certified)

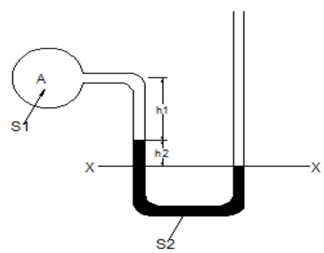
WINTER-2014 EXAMINATION

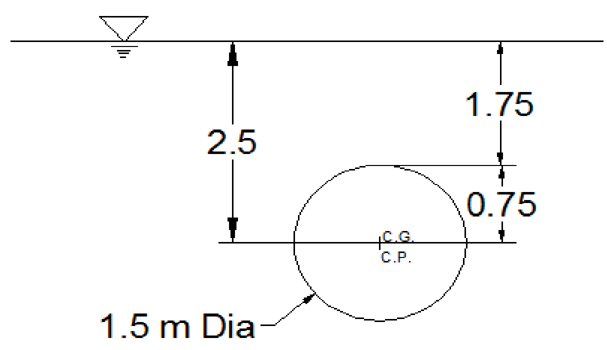
Subject code: 17421 **Model Answer**

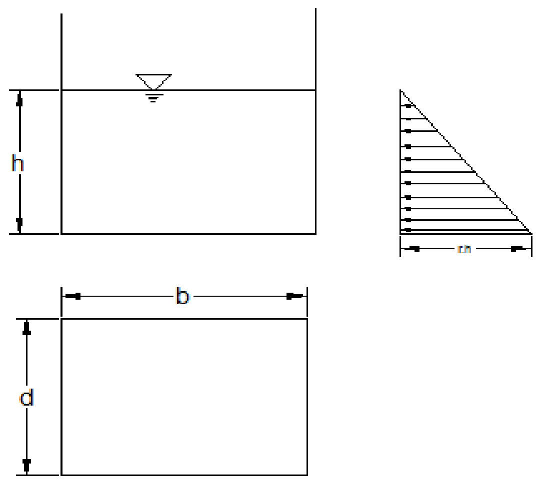
Important Instructions to examiners:

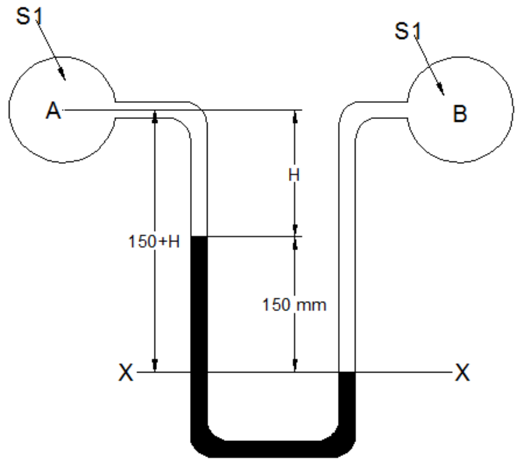
1) The answer should be examined by keywords and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language error such as grammatical, spelling errors should not be given more importance.(Not applicable for subject English and communication skill).
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figure drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In the some cases, the assumed constants values may vary and there may be some difference in the candidates answer and model answer.
6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidates understanding.

Q1 Attempt any TEN of the following	20
a) Define mass density & state its SI unit.	
Mass Density:- The mass density of a liquid may be defined as the mass per unit volume at standard temperature. **SI unit :-** kg/m^3	01 01
b) State four application of Hydraulics in environmental engineering.	
Ans:-Four applications of Hydraulics in environmental engineering. i) To design water distribution system from reservoir. ii) To determine the pressure head of water supply system. iii) To determine the power required for pumps. iv) To measure the pressure at a point. v) To design the pipe diameter of water supply line as well as sewer system. ***(Any four Points each 1 Mark each)**	*
c) Define ideal fluid and real fluid.	
Ans:- Ideal Fluid:-A fluid, which does not possess viscosity, Surface tension and compressibility is known as ideal fluid. **Real Fluid:-**A fluid, which possess viscosity, Surface tension and compressibility is known as real fluid.	01 01

d) State Newton's law of viscosity.	
Ans:- It states that "The shear stress on a layer of a fluid is directly proportional to the rate of shear strain". $\varsigma = (v/y) = \mu \text{ x } (v/y)$	02
e) A pressure of 1.2 Pascal applied to 650 litres of liquid caused a volume reduction by 1.5 litres. Calculate bulk modulus of elasticity for liquid	
Ans:- Given Data:- d_p = 1.2 pa. = 1.2 N/m^2 , V = 650 litres, d_v = 1.5 litres Bulk Modulus = K = -(dP/(dv/V)) = -(1.2/(1.5/650)) = - 520 N/m^2	 01 01
f) Define pressure &. State its SI unit.	
Ans:- Pressure at a point due to a liquid is defined as the force acting per unit area. SI unit :- N/m^2	01 01
g) How will you measure negative pressure?	
Ans:-Mercury in the U-tube is deflected by h_2 due pressure at point A, as deflection occurs in the left limb indicates that, pressure at A is negative (vacuum), pressure above the horizontal datum x-x in the left and right limb of the manometer should be same  Pressure above x-x in the left limb = $S_1h_2 + S_1h_1 + P_A$ Pressure above x-x in the right limb = 0 $P_A = -(S_1h_2 + S_1h_1)$---	01 01
h) Define Reynolds number	
A**ns:-** The Reynolds number is the ratio of inertia force to the viscous force.`````````````````````` R_N = (Inertia Force/ Viscous Force)	01 01
i) Mention necessity of inverted manometer	
Ans:-1) To measure low and negative pressure differences in two pipes. 2) To measure sensitive pressure	01 01
j) Write modified Darcy-Weisbach equation	
Ans:- Modified Darcy-Weisbach Equation $hf = \frac{fLQ^2}{12.1\ D^5}$	02
k) Define Froude's number	
Ans:- The Froude's number is defined as the square root of the ratio of inertia force of flowing fluid to the gravity force.	02

Fe = $\sqrt{\frac{Fi}{Fg}}$	
l) List four uses of pitot tube	
Ans:- i) The pitot tube is a simple and convenient instrument to measure the difference between static, total and dynamic pressure (or head) ii) To measure the velocity in cannel iii) To measure the velocity at a point in flow stream iv) Pitot-static tube can measure the fluid flow velocity by converting the kinetic energy in the fluid flow into potential energy	½ (each)
Q2. Attempt any FOUR of the following	16
a) State Pascal's law & its practical application	
Ans:- **Pascal's Law: -** Pascal's Law states that the pressure or intensity of pressure at a point in a static fluid is equal in all directions **Application: -** Law is applied in the construction of machines used for multiplying forces e.g. hydraulic jack, hydraulic pressure, hydraulic lift, hydraulic crane, hydraulic river, etc.	02 02
b) A circular plate 1.5 m diameter is placed vertically in water so that the centre plate is 2.5 m below the free surface Determine the total pressure on the plate and depth of centre of pressure.	
Ans:_ Given Data :- d = 1.5 m x = 2.5 m Sketch  Solution :- Area = A = $(\pi/4) \times d^2$ $= (\pi/4) \times 1.5^2 = 1.767\ m^2$ i) Total Pressure on gate F= w.AX X = Distance of C.G. from free surface of water = 2.5 m	 01

F = 9810 x 1.767 x 2.5 F = 43.34 x 10^3 N = 43.34 KN ii) Centre of Pressure. h = X + I.G. / AX I.G. = (π/64) x d^4= (π/64) x 1.5^4 = 0.2485 m^4 h = 2.5 +[0.2485/(1.767 x 2.5)] = 2.5 + 0.0563 = 2.556 m.	01 01 01
c) Draw a neat sketch of pressure diagram showing variation of pressure on vertical side wall of tank and horizontal bottom of tank containing liquid of specific weight 'r' upto a height of 'h'.	
 The pressure on side of the tank = ½ x γ h^2, The pressure on bottom of the tank = γ h x plan area of tank	02 01 01
d) Convert the pressure of 0.5 N/mm2 in metres of liquid of specific gravity 0.7.	
p = γ_L h = S_L γw h 0.5 = 0.7 x 9.81 x10^{-6} x h h =72812 mm h = 72.812 m	01 01 02
e) A differential manometer connected at the two points A & B on a horizontal pipe. Carrying specific gravity 0.8 shows a difference in mercury levels as 15 cm. Find the difference in pressure at the two points in of oil and N/m^2.	
Given :- S_1 = 0.8 , h = 15 cm = 150 mm, Sm = 13.6	



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The pressure head in the right limb above X-X

$= h_B + S_1 (H + 150)$ mm of water

$= h_B + S_1H + 150\ S_1$ mm of water.

The pressure head in the left limb above X-X

$= h_A + S_1H + Sm \times 150$ mm of water.

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Equating both pressure

$h_B + S_1H + 150S_1 = h_A + S_1H + Sm \times 150$ 01

$h_A - h_B = 150\ Sm - 150\ S_1$

$= 150(Sm - S_1)$

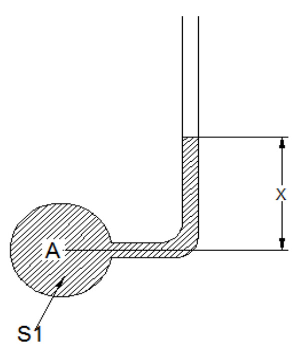
$= 150(13.6 - 0.8)$

$= 1920$ mm of water $= 1.92$ m of water

Difference of pressure $= w(h_A - h_B) = 9810 \times 1.92 = 18.835 \times 10^3\ N/m^2$

f) What is Piezometer and where it is used?

Piezometer:- A piezometer tube is the simplest form of instrument, used for measuring moderate pressures. It consists of a tube one end of which is connected to the pipe line in which the pressure is required to be found out. The other end is open to the atmosphere in which the liquid can rise freely without overflow. The height to which the liquid rises up in the tube gives the pressure head directly. 02



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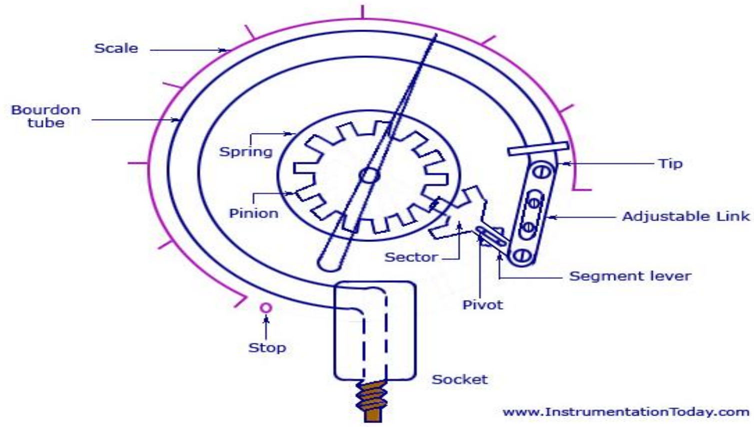
Use:- To measure pressure at a point in the pipe.

Q3. Attempt any FOUR of the following	16
a) Explain with neat sketch the working of Burdon's tube pressure guage	
Ans:- **Diagram :**  Bourdon Tube Pressure Gauge **Working:-**Bourdon tube pressure gauge is used to measure high pressure. It consists of tube as shown in fig. having elliptical cross section. This tube is called as Bourdons Tube. One end of this tube is connected the point whose pressure is to be measured and other end free. When fluid enters in the tube elliptical cross section of tube becomes circular. Due to this the free end of tube shifts outward. This motion is transferred through link and pointer arrangement. The pointer moves over a calibrated scale, which directly indicates the pressure in terms of N/m^2 or m head of mercury.	02 02
b) State the practical applications and limitations of Bernoulli's theorem	
Ans:- **Practical applications of Bernoulli's theorem:-** 1) In all problem of incompressible fluid flow where energy consideration are involved. 2) To derived various formula in hydraulics. 3) To find discharge through venturimeter, to find dimension of convergent cone throat, divergent cone. 4) To find discharge in pipe using an orifice meter. 5) To find the velocity and flow at the required point a pipe or stream using pitoot tube. **limitations of Bernoulli's theorem are below :-** Bernoulli's theorem has been derived an certain assumptions ,which are rarely possible ,which show that Bernoulli's theorem ,has same limitation in the application may be as . **Bernoulli's theorem is not applicable :-** 1) For fluid with non-uniform flow. 2) For fluid with unsteady flow. 3) For fluid with zero viscosity. 4) For fluid flow where there is no loss of energy. 5) For fluid flow with other than gravitational force.	02 (any two) 02 (any two)

c) Distinguish between Laminas and Turbulent flow. (four points each)

*

Laminar Flow	Turbulant flow
1) Each Pratical moves in a definite path and do not cross each other.	1) The fluid partical continuously mis and cross each other.
2) It occurs at low velocity of flow.	2) It occurs at high velocity of flow.
3) This flow occurs in viscous fluids	3) This flow occurs in fluid having very less viscosity.
4) Reynold's number is less than 2000	4) Reynold's number is less than 2000
5) Fluid particle move in layers with one layer over the another.	5) Fluid Particle moves in disorderly manner, they cross the path of each other.
6) Sketch	6) Sketch
7) Example	7) Example

(Any four Points each 1 Mark)

d) A pipe line carrying oil (Sp Gr. 0.8) changes in diameter from 300 mm at position 1 to 600 mm diameter at position 2 which is 5 in at a higher level If the pressure at position I & 2 are 100 kN/m2 & 60 kN/rn2 respectively and the discharge is 300 lit/s. Determine the loss of head

Ans:-Given oil sp.gr =0.8

d_1=300mm ,d2=600mm ,z1=0 m , z2=5m ,

p1=100 KN/m 2 , p2=60 KN/m 2

Q=discharge =300Lit/Sec =0.3m3/Sec

Using continuity equation

Q=a1v1=a2v2

$a_1= \frac{\pi}{4} \times (0.3)^2=0.07068\ m^2$

$a_2= \frac{\pi}{4} \times (0.6)^2=0.28274\ m^2$ 01

$0.3=0.07068 \times v^1=0.28274 \times v^2$

Therefore ,

$V^1=4.244$ m /Sec

$V^2=1.061$ m/Sec

Now, Total head at position 1 -Using bernoulli's equation

$=Z_1 +(P_1) / \gamma + (v_1)^2 / 2g$

$=0+(100)/(9.81 \times 0.8) + (4.244)^2/(2 \times 9.981)=13.6601$ m of water 01

Total head at position 2 -Using bernoulli's equation 01

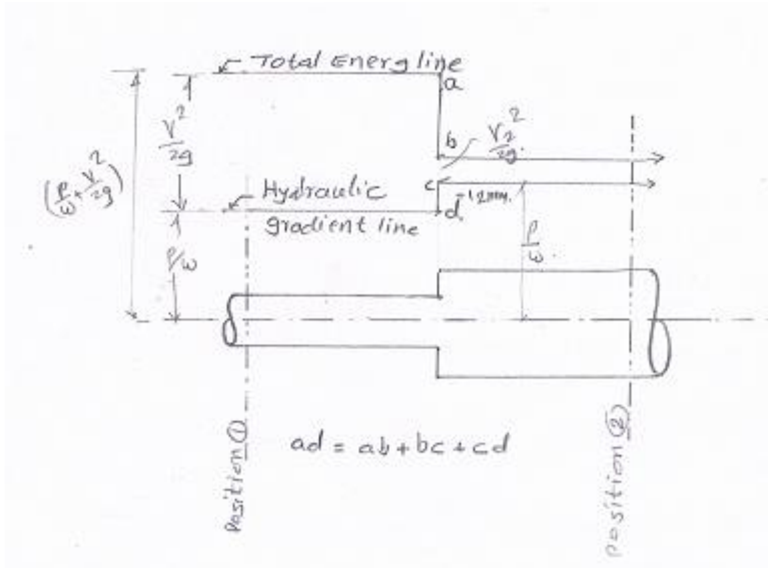
$=Z_1 +(P_1) / \gamma + (v_1)^2 / 2g$

$=5+(60)/(9.81 \times 0.8) + (1.061)^2/(2 \times 9.981)=12.7116$ m of water 01

Loss of head =hf=(13.6601-12.7116)=0.9485 m of water

e) At a sudden enlargement of water line a 250 mm diameter to 500 mm diameter pipe, the hydraulic gradient uses. by 12 mm Calculate the discharge through pipe.

Ans:-



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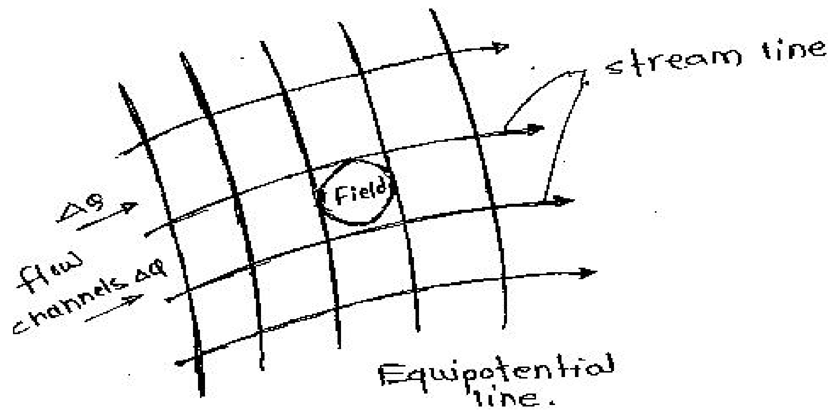
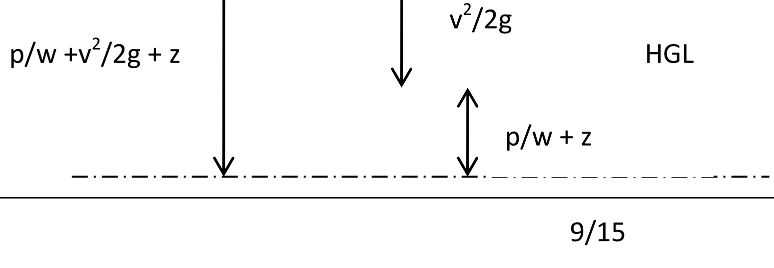
Let, v1=velocity of water at section 1,
v2=velocity of water at section 2,
Let us draw hydraulic gradient line and total energy line above canter line of pipe as below .
From the equation of continuity
a_1v_1=a2v2
$= \frac{\pi}{4}$ x $(250)^2$ x v1 $= \frac{\pi}{4}$ x $(500)^2$ x v2
Therefore
V1=4v2 — 01
Now from the geometry of figure above
Ad=ab+bc+cd
$(v1)^2/2g=(v1-v2)2/2g + (v_2)^2/2g$ + 12 mm
$(4v2)^2/2g=(4v2-v2)^2/2g + (v2)^2/2g$ + 12 mm

$=(16(v2)^2)/2g=(9(v_2)^2)/2g +(v_2)^2/2g$ + 12 mm — 01
$= (v2)^2 =(12 \times 9.81 \times 1000)/ 3$
$=(v_2)$=198.09 mm/Sec
Therefore
$Q=a_2 \times v_2$
$=\pi/4 \times (500)^2 \times 198.09$
=38894880.55 mm^3 /Sec — 01
=38894880.55 / $(10)^6$=38.895 lit/Sec.

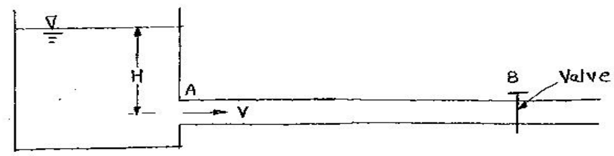
f) What is flow net ' State applications of flow net.

Flow net:-Flow net is the graphical method of seepage analysis .The method of flow net construction is based on trial sketching .It is graphical presentation of stream liner & equipotential lines, A set of stream line and equipotential lines constitute a flow net .The flow lines & equipotential lines meet at right angles to one another The fields are approximately squares ,so that circle can be drawn touching all four sides of the square . — 02

 Applications of flow net:- 1) In seepage analysis of dam foundation 2) In seepage analysis of body of dam , 3) In the design of hydraulic structures.	02
Q4. Attempt any FOUR of the following.	16
a) Define friction factor & state any four factors affecting friction factor.	
Friction Factor :- A dimension less quantity depends upon the roughness inside the pipe ,viscosity of liquid flowing throw pipes which affect's head loss is known as Friction Factor.	02
factors affecting friction factor:-(ANY TWO) 1) Nature of Surface of Pipe material 2) Pipe diameter 3) Length of pipeline 4) Head loss **5)** Square of Velocity of flow	02
b) Explain HGL and TEL with curve.	
Hydraulic Gradient Line (HGL): It is the line which gives the sum of pressure head (p/w) and datum head (z) of a flowing fluid in a pipe with respect to some reference line .Hydraulic gradient line is obtained by joining the top of all vertical ordinates, showing the pressure head (p/w) of flowing fluid in a pipe from the center of the pipe.	01
Total Energy Line(TEL):): It is the line which gives the sum of pressure head(p/w),datum head(z) and kinetic head($v^2/2g$) of a flowing fluid in a pipe with respect to some reference line .Total energy line is obtained by joining the tops of all vertical ordinates, showing the pressure head(p/w) and kinetic head($v^2/2g$) of flowing fluid in a pipe from the center of the pipe.	01
 	02

c) What do you mean by water hammer ' State its causes (any three)

Ans:-



Water Hammer

Water Hammer-When the water flowing in a long pipe is suddenly brought to rest by closing the valve, there will be a sudden rise in pressure due to the momentum of the moving water being destroyed. This causes a wave of high pressure to be transmitted along the pipe which creates noise known as water hammer .The rise in pressure in some cases may be so large that the pipe may even burst. Therefore it is essential to take into account this pressure rise in the design of pipes. The magnitude of pressure rise depends on the speed at which the valve is closed, velocity of flow, length of the pipe and elastic properties of the pipe material as well as flowing fluid. 02

Causes.

If a fluid flowing in a pipe is suddenly brought to rest by closing the valve, there will be sudden rise in pressure due to momentum of the moving fluid being destroyed. 02

1) This causes a series of pressure vibrations.
2) These vibrations setups noises in the pipe.

d) A diameter of a horizontal pipe suddenly changes from 25 cm to 30 cm. Calculate the loss of head, if discharge is 370 lit/sec

Ans:-

$Q=0.37m^3/Sec$

$D1=.25$ m ,$d2=0.30$ m ,

$A1=(\pi/4 \times (0.25)^2 =0.049\ m^2$ 01

$A2=(\pi/4 \times (0.30)^2 =0.0707\ m^2$

$V1=(0.37/0.049)=7.5510$ m/Sec 01

$V2=(0.37/0.0707)=5.2333$ m/Sec

Head loss $=(v1-v2)^2/2g =(7.5510-5.2333\ )^2/2 \times 9.81$ 01

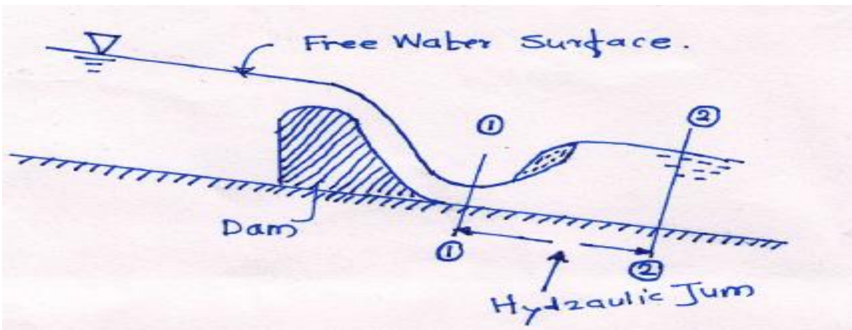
=0.2737 m 01

e) Two reservoirs having a difference in elevation of 15 in connected by a 200 mm diameter siphon. The length of the siphon is 400 in the summit is 3 in the water level in the upper reservoir. The length of the pipe from upper reservoir to the summit is 120 mm. Determine the discharge through siphon, if the coefficient of friction is 0.005.

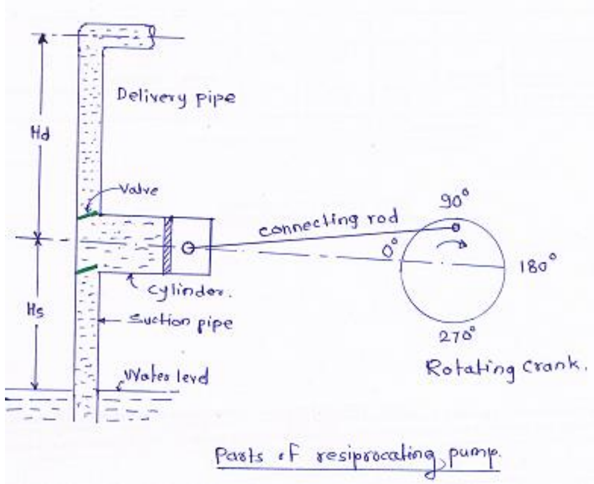
Ans:-

Difference in elevation between two reservoir =15 m
Diameter of siphon =D=0.2 m
length of siphon=L=400 m
coefficient of friction = f = 0.005
Neglecting minor losses at entry and exit

Total head = frictional head = H=hf=$(fLv^2)/2 \times g \times D$ 15=$(0.005 \times 400 \times v^2)/(2 \times 9.81 \times 0.2)$ V=2.765 m/Sec Discharge =Q=$(\pi/4 \times (D)^2) \times v$ Q=$(\pi/4 \times (0.2)^2) \times 2.765$ Q=0.0868 m3/Sec Q=86.86 lit/Sec	01 01 01 01
f) Water is flowing through a rectangular channel of width 8 in bed slope 1 in 1000. Depth of flowing channel is 5 in. Find the discharge through the channel. Take Chezy's constant C = 50.	
Ans:- A=(8 x 5) =40 m^2 Q=(a x v) Using chezy's formula, V=$c\sqrt{mi}$ m=hydraulic mean depth = A/p i= bed slope =1 in 1000 =0.001,c= chezy's constant =50 p=(b+2d)=(8+2 x 5)=18 m m=hydraulic mean depth = A/p=(40/18)=2.22 Q=$(a \times c\sqrt{mi})=(40 \times 50 \times \sqrt{(2.22 X 0.001)})$ Q =94.2337 m^3/Sec Q=94233.7 lit /Sec	 01 01 01 01
Q5. Attempt any TWO of the following:	16
a) A trapezoidal channel section has side slope 2 vertical to 3 horizontal. It is discharging water at a rate of 20 cumecs with bed slope 1 in 2000. Design the channel for its best form. Take Manning's constant 0.01.	
Ans:- Type of channel : trapezoidal channel , Side slope of channel =3H: 2V, Discharge =Q= 20 cumecs = 20 m^3/sec ,Bed slope = i=1 in 2000 =1/2000 ,Mannigs constant =N=0.01 Let ,b = base width of channel , d = depth of flow Side slope 3H:2V n/1=3/2 n=3/2 Trapezoidal channel is designed for best form, We have condition $d\sqrt{(n^2+1)}=1/2(b+2nd)$ $d\sqrt{[(3/2)2+1]}$ =1/2[b+2x(3/2) x d] 1.80 d=0.5b +1.5d 0.3d=0.5b **b =0.6 d** Put the value of b in below eqn, A=(b+ nd) d A=[0.6d +(3/2) x d]d A=2.1 d^2	 01 01 01

Wetted perimeter = P= 2d $\sqrt{(n^2+1)}$+ b = 2d $\sqrt{[(3/2)2+1]}$+0.6 d = 4.205 d Hydraulic radius =R=A/P = 2.1 d^2/4.205 d = 0.499 d = 0.5 d Manning's formula Q=Ax1/N $R^{2/3}$ i ^{½} 20 = 2.1d^2 (1/0.01) x $(0.5\ d)^{2/3}$ x $(1/2000)^{1/2}$ **d =** depth of flow = **2.36 m** **b = base width of channel =0.6 d =0.6 x 2.36= 1.42 m**	01 02 01 01
b) What do you mean by Hydraulic Jump? Explain with sketch. State the types of hydraulic jump with Froude's number.	
Ans:-  **Hydraulic Jump:-** Consider the flow of water over a dam .The height of water at section 1-1 is small; as we move toward downstream the height or depth of water increases rapidly over a short length of the channel this is because at the section 1-1 is less than critical depth. Shooting flow is an unstable type of flow is and does not continue on the downstream side. Then this shooting will convert itself into a streaming flow & hence depth of water will increase. This sudden increase of depth of water is called a hydraulic jump. OR when supercritical flow changes to subcritical then sudden rise of water occurs, this sudden increase of depth of water is called a hydraulic jump. Types of flow with Froude's number (Fe) number:- 1) Critical flow, Fe = 1 2) Subcritical flow or streaming flow, Fe < 1 3) Super Critical or Shooing flow, Fe > 1 ***(Note :-Instead of types of hydraulic jump consider types of flow)***	02 04 02
c) A 150 mm x 75 mm venturimeter placed vertically with the throat 22.5 mm above the inlet conveys oils of specific gravity 0.78 at 29 litres per sec. Calculate the difference of pressure between inlet and throat Take Cd = 0.96.	

Ans:-	
Given data.	
Diameter at inlet = d_1 = 150 mm = 0.150 m	
Diameter at throat = d_2 =75 mm = 0.075 m	
Coefficient of meter = Cd = 0.96	
Discharge = Q = 29 lit/ sec = 29 x 10^{-3} m^3/sec	
a_1= area at inlet of venturimeter.	
$= \frac{\pi}{4} d_1^2 = \frac{\pi}{-4} \times (0.15)^2 = 1.76\times 10^{-2}$ m^2	01
a_2 = area at throat of venturimeter,	
$= \frac{\pi}{4} d_2^2 = \frac{\pi}{-4} \times (0.075)^2 = 4.418 \times 10^{-3}$ m^2	
Sp gr of oil = 0.78	
Difference of elevations of the throat section and entrance section = 22.5 mm = 0.0225 m	
We have continuity eqn.	
Q = A V	
Velocity of oil at entrance ,	
Q = A_1 x V_1	01
29 x 10^{-3} = 1.76× 10^{-2} x V_1	
V_1 = 1.65 m/sec.	
Similarly	01
Q = A_2 x V_2	
29 x 10^{-3} = 4.418× 10^{-3} x V_2	01
V_2 = 6.564 m/sec.	01
Applying Bernoulli's theorem for entrance and the throat section,	
$P_1/w + V_1^2/2g + Z_1 = P_2/w + V_2^2/2g+Z_2$	01
$P_1/w + (1.65)^2/2 \times 9.81 + 0 = P_2/w +(6.564)^2/2 \times 9.81+0.0225$	
$P_1/w + 0.139+0 = P_2/w +2.2225$	
$(P_2/w)- (P_1/w) = 2.2225- 0.139$	02
= 2.084 m of oil.	
= 20.84 cm of oil	
Q6. Attempt any two of the following.	16
a) Draw a neat sketch of a Reciprocating pump showing its various component parts. Mention function of each component.	
Ans:-	*



Component part and its function -

i) Cylinder:-To guide movement of piston and create negative and positive pressure.

ii) Section pipe:-To connect source of water and the cylinder

iii) Delivery pipe:-To receive water from cylinder and discharge it at outlet

iv) Valve:-To admits flow from the suction pipe into the cylinder and from cylinder into delivery pipe.

v) Rotating crank:-To give linear displacement to connecting rod.

vi) Connecting rod:-To connects the piston and the rotating crank.

**** Note :- (Diagram 2 marks ,labelling 2 marks, any four component with function 4 marks)***

b) A horizontal venturimeter is installed in a pipe of 20 cm diameter carries 50 lps of water with a differential mercury manometer reading of 12.6 cm. Calculate the throat diameter in metre. Assume' coefficient of meter is 0.98.

Ans:-

Given data.

Diameter at inlet = d_1 = 20 cm = 0.2 m

Diameter at throat = d_2 =?

Monometer reading = x = 12.6 cm = 0.126 m.

Coefficient of meter = Cd = 0.98

Discharge through venturimeter = Q =50 lps = 50 x 10^{-3} m^3/s

a_1= area at inlet of venturimeter.

$= \frac{\pi}{4} d_1^2 = \frac{\pi}{-4} \times (0.2)^2 = 3.14\times 10^{-2}$ m^2

$^a{}_2$ = area at throat of venturimeter, 01

$h = x\left[\frac{Sm}{Sw} - 1\right]$

$h = 0.126\left[\frac{13.6}{1} - 1\right]$ 01

$= 0.126 \times 12.6$

=1.5876 m of water 01

$Q = Cd \text{ x } \frac{a1\ a2}{\sqrt{a1^2 - a2^2}} \text{ x } \sqrt{2gh}$

$Q = Cd \times \frac{a1}{\sqrt{\left(\frac{a1}{a2}\right)^2 - 1}} \times \sqrt{2gh}$	01
$50 \times 10^{-3} = 0.98 \times \frac{3.14\times 10^{-2} \times a2}{\sqrt{(3.14\times 10^{-2})^2 - (a2)^2}} \times \sqrt{2 \times 9.81 \times 1.5876}$	02
$a_2 = 8.777 \times 10^{-3}\ m^2$	
$a_2 = \frac{\pi}{4} d_2^2$	
$8.777 \times 10^{-3} = (3.14/4) \times d_2^2$	02
d_2 = Diameter of throat = 0.1057 m	
c) Why triangular notches are preferred than rectangular notches? Find the discharge over the triangular notch of angle 60° when the head over the notch is 20 cm. Take Cd = 0.625.	
Triangular notches are preferred than rectangular notches because :-	
1) Only one reading i.e head (H) is required to be taken for measurement of rate of flow in a given triangular notch.	01
2) If in triangular notch the angle of the notch i.e. $\theta = 90^o$, the formula become very simple to remember.	01
3) A triangular notch gives more accurate result for low rate of flow than a rectangular notch.	01
4) The same triangular notch can measure a wide range of flows accurately.	01
Given data;-	
Type of notch = triangular	
Angle of notch = $\theta = 60^0$	
Head over notch =H=20 cm =0.20 m	
Coefficient of discharge =Cd =0.625	
Discharge = Q =?	
For triangular notch discharge can be calculated by using formula.	
$Q = 8/15\, C_d.\sqrt{2g}\ \tan \theta/2 \times H^{5/2}$	02
$= 8/15 \times 0.625 \times \sqrt{2 \times 9.81} \times \tan(60/2) \times (0.20)^{5/2}$	
$= 0.01525\ m^3/sec$	
Discharge over triangular notch = 0.01525 m^3/sec .	02