Model Answer: Winter - 2019

Subject: Hydraulics

Sub. Code: 22401

Important Instructions to Examiners:

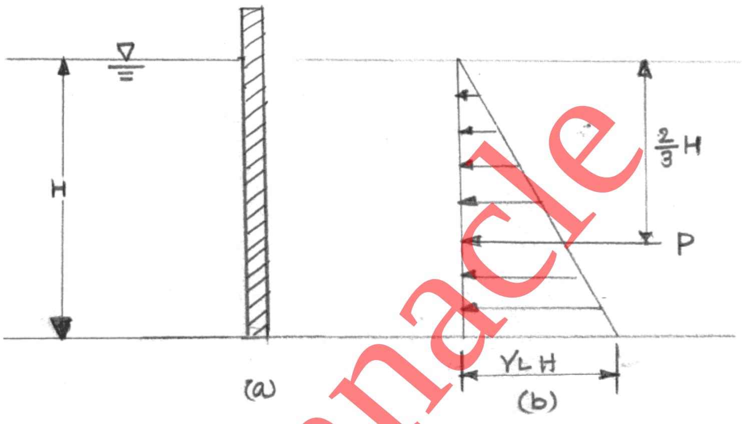
1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more importance. (Not applicable for subject English and Communication Skills.)
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by the candidate and those in the 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 some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and the model answer.
6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

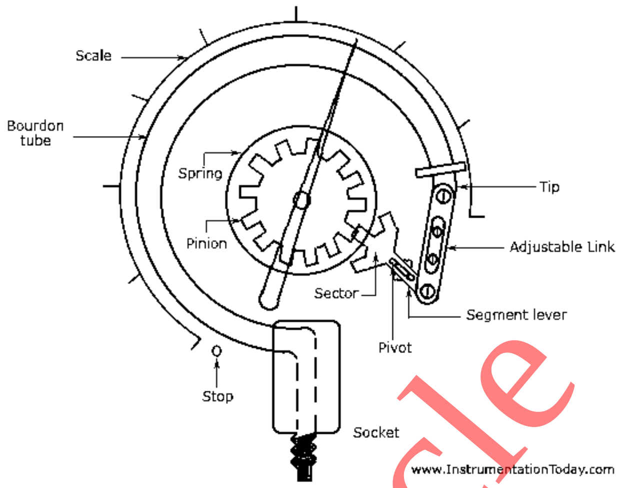
Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.1		**Attempt any FIVE of the following:**		10
	a)	**Define viscosity.**		
	Ans.	It is defined as the property of fluid by virtue of which the motion of lower layer is opposed by upper layer. OR It is defined as shear stress required to produce unit rate of shear strain.	2	2
	b)	**Why mercury is used in manometer?**		
	Ans.	Following are the reasons due to which mercury is used in manometers :- i. Specific gravity of mercury is greater than the other liquids. ii. Mercury is immiscible with other liquids. iii. It does not stick to the surface in contact.	1 each (any two)	2
	c)	**Define pressure head and give its unit.**		
	Ans.	**Pressure head-** It is the head possessed by fluid due to having some pressure force by the flowing fluid. $h = \frac{P}{\gamma}$	1	
		SI unit of pressure head is meter (m)	1	2

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.1	d)	**Define Reynold's number.**		
	Ans.	The Reynolds number is defined as the ratio of inertia force to viscous force. Reynolds number is dimensionless number. It is used to determine the laminar or turbulent flow type. $Re = \frac{\text{inertial force}}{\text{viscous force}} = \frac{F_i}{F_v}$	2	2
	e)	**State the principle of venturimeter.**		
	Ans.	**Principle of venturimeter** : - It is based on Bernoulli's equation that is the velocity increases in an accelerated flow by reducing the cross section area of the flow passage.	2	2
	f)	**Define discharge and state its unit.**		
	Ans.	**Discharge** – It is defined as the quantity of liquid flowing per second through a section of pipe or a channel.	1	
		SI unit of discharge is m^3/sec. or lit/sec	1	2
	g)	**State two uses of syphon.**		
	Ans.	i. To take out water from one reservoir to another reservoir separated by a hill or ridge. ii. To drain out water from a channel without any outlet. iii. To take out the water from a tank not having any outlet.	1 each (any two)	2
	h)	**Define hydraulic radius for trapezoidal channel.**		
	Ans.	**Hydraulic Radius:** It is the ratio of the wetted area to wetted perimeter. It is also called as Hydraulic mean depth. R= Wetted area / Wetted perimeter = A/P	2	2

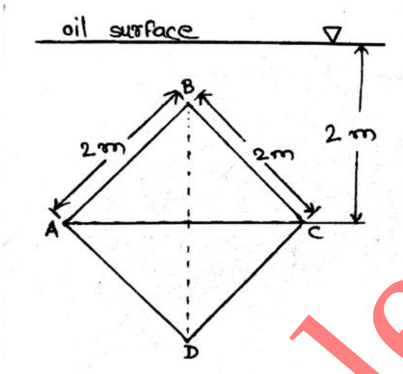
Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.2		**Attempt any THREE of the following:**		**12**
	a)	**Write any two application of hydraulics in Irrigation Engineering.**		
	Ans.	Applications of hydraulics with respect to Irrigation are as follows- i. To calculate discharge flowing through canal. ii. For distribution of equal water for city or agriculture purpose using water meter. iii. To determine velocity of flow at a point in open channel. iv. The total pressure and Centre of pressure acting on dam face at the point the resultant cuts the base of the can be determined. **v.** Spillway can also designed to pass off water on D/S of a dam.	**2 each (any two)**	**4**

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.2	b) Ans.	**A liquid weigh 25 kN and occupies 3.75 m^3, find its specific weight, mass density, specific gravity and specific volume.** Weight of liquid $W = 25kN = 25\times10^3 N$ Volume of liquid $V = 3.75m^3$ 1. Specific weight $(\gamma_L) = \frac{\text{weight}}{\text{volume}}$ $\gamma_L = \frac{W}{V} = \frac{25\times10^3}{3.75}$ $\boxed{\gamma_L = 6666.66 N/m^3}$	1	
		2. Specific Gravity (S)= $\frac{\text{Sp.weight of liquid}}{\text{Sp.weight of pure water}}$ $S = \frac{V_L}{\gamma_w} = \frac{6666.66}{9810}$ $\boxed{S = 0.679}$	1	
		3. Specific Volume$(V_s) = \frac{\text{Volume}}{\text{Weight}}$ $V_s = \frac{1}{\gamma} = \frac{1}{6666.66}$ $\boxed{V_s = 1.5\times10^{-4} m^3/N}$ OR $V_s = \frac{V}{W} = \frac{3.75}{25\times10^3}$ $\boxed{V_s = 1.5\times10^{-4} m^3/N}$	1	
		4. Mass density (ρ) $\gamma = \rho\times g$ $6666.66 = \rho\times9.81$ $\boxed{\rho = 679.577 kg/m^3}$	1	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.2	c) Ans.	**Explain the concept and use of pressure diagram with neat sketches.**		
		Pressure diagram is defined as "It is the graphical representation of variation of pressure on the surface with depth". The total pressure per unit length is the area of pressure diagram. The position of center of the pressure is the position of center of gravity of the pressure diagram.	1	
			1	
		Uses: i. To Calculate pressure exerted by liquid on the one side of surface. ii. To Calculate pressure due to liquid on both the side of surface iii. To Calculate pressure on vertical and inclined faces of dam. iv. To Calculate pressure on sluice gate, side and bottom of water tank. v. To find position of centre of pressure.	1 each (any two)	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.2	d)	**Explain with a neat sketch the working of Bourdon's pressure guage.**		
	Ans.	 Bourdon Tube Pressure Gauge ***(Note: 1 mark for sketch and 1 mark for labeling.)***	2	
		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. As the pressure in the case containing the bourdon tube is usually atmospheric, the pointer indicates gauge pressure.	2	4

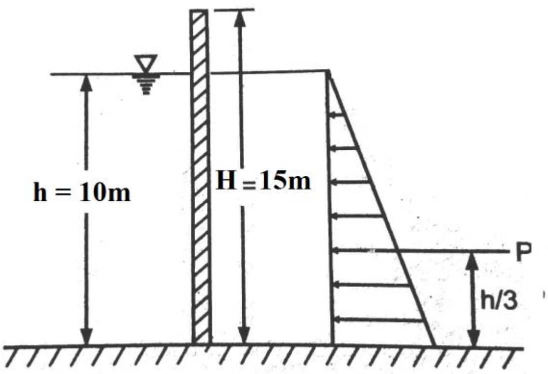
Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.2	e) Ans.	**State the causes and remedial measures of water hammer in pipes.** **Causes of water hammer:** i. A water hammer commonly occurs when fluid flowing with high velocity in the pipe is brought to rest with a valve closes suddenly at an end of a pipeline system. ii. A pressure wave propagates in the pipe.	**1 each**	
		Remedial measures of water hammer: i. Valve should be closed gradually. ii. A surge tank is used near valve. iii. Use pressure relief valve. iv. The turbine gates are opened gradually. v. Air chambers are provided on the upstream of valves on long pipe lines.	**1 each (any two)**	**4**

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.3		**Attempt any THREE of the following :**		**12**
	a)	**A square plate is submerged vertically in oil of specific gravity 0.9 as shown in Fig. No. 1. Find the total pressure and position of centre of pressure.**		
	Ans.	 **Fig. No. 1**		
		Given Data: Side of square plate (a) = 2m Specific gravity of oil = 0.9		
		Distance of centroid from free surface ($\bar{x}$)= 2m	½	
		Solution: Area of plate (A)= $a^2 = 2^2 = 4\ m^2$	½	
		Moment of Inertia about its centroid $I_G = \frac{a^4}{12} = \frac{2^4}{12} = 1.33\ m^4$	1	
		Total Pressure (P) = $\gamma A \bar{x}$ = 0.9x9.81x4x2 = 70.632 kN	1	
		Position of centre of pressure ($\bar{h}$) = $\bar{x} + \frac{I_G}{A\bar{x}}$ $= 2 + \frac{1.33}{4x2}$ = 2.166 m ∴ The total pressure is 70.632 kN acting at 2.166 m from free surface.	1	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.3	b)	**Explain Reynold's number with its equation and give significance.**		
	Ans.	The Reynolds number is defined as the ratio of inertia force to viscous force. Reynolds number is dimensionless number. It is used to determine the laminar or turbulent flow type.	1	
		$\text{Re} = \dfrac{\text{inertial force}}{\text{viscous force}} = \dfrac{F_i}{F_v}$ $\text{Re} = \dfrac{\rho V d}{\mu}$ OR $\text{Re} = \dfrac{V d}{\vartheta}$	1	
		where, Re= Reynolds number ρ = Mass density of fluid in (kg/m^3) V = Velocity of flow in (m/sec) d = Diameter of pipe in (m) μ = Dynamic viscosity (N-s/m^3) ϑ = Kinematic viscosity (m^3/s)	1	
		Significance : Using value of Reynold's number the type of flow can be identified. If Re < 2000, Flow is laminar flow If 2000 < Re < 4000, Flow is in transition state if Re > 4000, Flow is turbulent Flow	1	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.3	c)	**Differentiate any four points between notch and weir.**		
	Ans.	(see table below)	1 each (any four)	4
	d)	**A concrete dam 15 m deep and 2 m wide containing water to a depth of 10 m .Find total hydrostatic pressure per meter run and centre of pressure on upstream face.**		
	Ans.	(see figure below)		

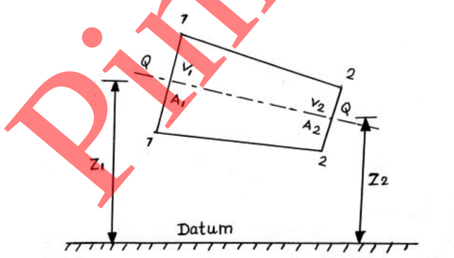
Sr.No.	Notch	Weir
1	It is an opening provided on one side of the tank or reservoir with free surface of liquid below the top edge of the opening.	It is a structure which obstructs the flow in an open channel.
2	It is a device used for measuring the rate of flow of liquid through a small channel or a tank	It is used for measuring the rate of flow of water in rivers or streams.
3	Notches are made of metallic plates	Weirs are made of concrete or masonry structure
4	Notch is of small sizes.	Weir is of bigger sizes.
5	e. g. Rectangular, Triangular, Trapezoidal, stepped notch.	e. g. According to shape, discharge, width of crest, nature of crest.

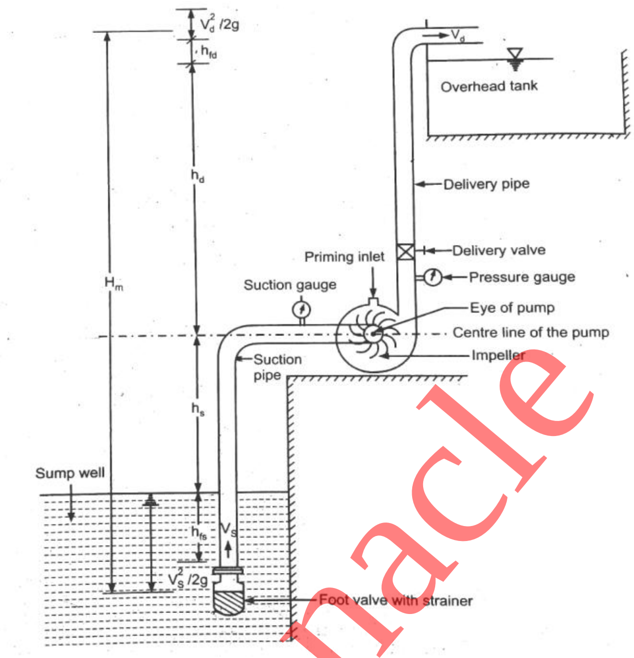


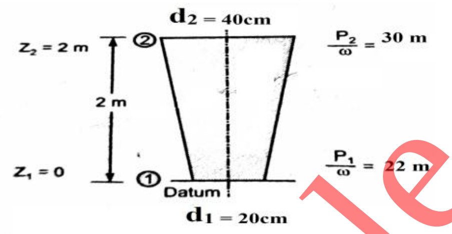
Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.3	**Ans.**	Given Data: Height of dam (H) = 15m Depth of water (h) = 10m Find : P and $\bar{h}$ Hydrostatic Pressure (P) $P = \frac{1}{2}\gamma_w h^2$ $P = \frac{1}{2}$ x 9.810 x 10^2 = 490.5 kN per meter length of dam.	**2**	
		Centre of pressure ($\bar{h}$) $\bar{h} = \frac{h}{3}$ from base $= \frac{10}{3} = 3.33$m from the base of dam.	**2**	**4**
	e)	**Water is flowing through a rectangular channel of width 5 m and bed slope 1 in 1200 .Depth of flow is 1.75 m. Find the discharge through the channel .Take c = 50**		
	Ans.	Given- Width, (b) = 5m , Depth (d) = 1.75m ,C =50, Bed Slope (S) $= \frac{1}{1200}$ By Chezy's formula $= C\sqrt{RS}$ Discharge (Q) $= AC\sqrt{RS}$	½ ½	
		Cross-section area of channel, A= b×d $A = 5\times1.75 = 8.75m^2$ Hydraulic mean depth (R) $= \frac{A}{P}$ Perimeter (P) = b+2d	½ ½	
		$R = \frac{A}{b+2d} = \frac{8.75}{5+2\times1.75} = \frac{8.75}{8.5}$ R = 1.029 m $Q = AC\sqrt{RS}$ $Q = 8.75\times50\sqrt{1.029\times\frac{1}{1200}}$	**1**	
		$Q = 12.811\ m^3/sec$ Discharge through channel, $Q = 12.811\ m^3/sec$	**1**	**4**

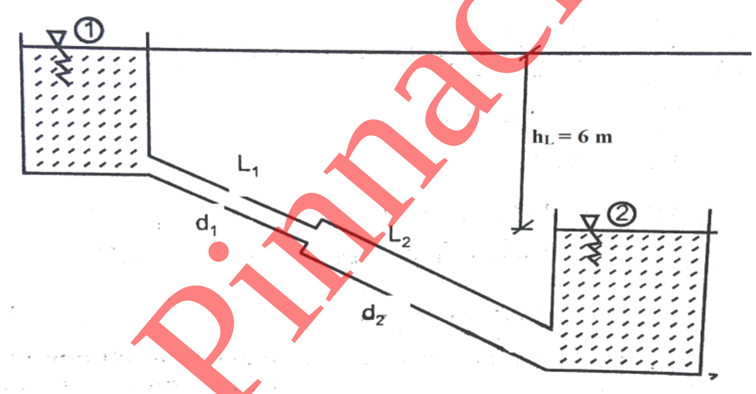
Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q. 4		**Attempt any <u>THREE</u> of the following:**		12
	a)	**What is most economical channel section ? Write conditions for rectangular channel section to be economical .**		
	Ans.	**Most Economical Channel Section:** - A channel which gives max. discharge for a given c/s area & bed slope and coefficient of roughness is called as Most Economical Channel Section. OR The most economical channel section is the one which gives maximum discharge for a given amount of excavation.	2	
		Condition for rectangular channel: - i) $b = 2d$ ii) $R = d/2$	1 each	4
	b)	**Differentiate between the turbines and pumps on any two factors.**		
	Ans.	(see table below)	2 each (any two)	4

Sr. No.	Turbine	Pump
1	It is a Machine that convert hydraulic energy into mechanical energy.	It is a device that converts mechanical energy into hydraulic energy.
2	Turbines are used for electricity generation	Pumps are used for pressure generation.
3	Types of turbines are : a) Impulse turbine b) Reaction turbine	Types of pumps are : a) Centrifugal pump b) Reciprocating pump
4	A turbine decreases the energy.	A pump increases the energy of the fluid stream
5	It is used to extract energy from fluid flow	It is used to lift liquid from one level to other.

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.4	c)	**A centrifugal pump is required to pump 15 lit/sec against head of 32 m. Find the power required by the pump taking overall efficiency 75%**		
	Ans.	Given:		
		Discharge (Q) = 15 lit/sec = 0.015 m^3 / sec	½	
		Head(H_m) = 32m,		
		Efficiency(η) = 75% = 0.75	½	
		Find : Power (P)		
		Solution :		
		$P = \frac{w\ Q\ H_m}{\eta}$	1	
		$P = \frac{9.810 \times 0.015 \times 32}{0.75}$	1	
		$\boxed{P = 6.278\ kW}$	1	4
	d)	**State Bernoulli's theorem. State any two application of it.**		
	Ans.			
		It states that in a steady, ideal flow of an incompressible fluid, the total energy at any point of the fluid is always constant. Total energy = Constant Pressure energy + Kinetic energy + Potential energy = Constant	1	
		$\boxed{\frac{P}{\gamma_L} + \frac{V^2}{2g} + Z = \text{Constant}}$	½	
		where, $\frac{P}{\gamma_L}$ =Pressure head, $\frac{V^2}{2g}$ = Velocity head, Z = datum head	½	
		Applications:		
		Bernoulli's theorem is applicable to all problems of incompressible fluid flow ,where energy considerations are involed. Practical application of Bernoulli's in following devices: i) Venturimeter ii) Orifice meter iii) Pitot tube	2	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.4	e)	**Explain with neat sketch working of centrifugal pump.**		
	Ans.		2	
		(Note: 1 mark for sketch and 1 mark for labeling.)		
		Working of centrifugal pump is in three stages		
		i. Priming ii. Starting iii stoping	½	
		i. Priming- The operation of filling the casing, impeller and suction pipe upto delivery valve is called priming.	½	
		ii.Starting- Before starting first of all check that priming is done and return valve is not in closed condition.	½	
		iii.Stoping - To stop the pump, delivery valve should be closed partly. Motor is switched off and then value is closed fully.	½	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.5		**Attempt any TWO of the following**		12
	a)	A conical pipe has diameter 40 cm at the larger end and 20 cm at the smaller end and forms a part of a vertical main. The pressure head at the larger end is found to be 30 m and the smaller end 22 m of water .find the discharge through the pipe ,if the length of conical portion is 2 m. Assuming no losses and the larger is at the top.		
	Ans.			
		Given:		
		d_1=0.20 m, d_2=0.40 m, Z_1=0,Z_2=2m	½	
		Pressure head at smaller end , $\frac{P_1}{\gamma}$=22m	½	
		Pressure head at larger end , $\frac{P_2}{\gamma}$=30m	½	
		Solution:		
		$a_1=\frac{\pi}{4}(d_1)^2=\frac{\pi}{4}(0.20)^2=0.0314m^2$		
		$a_2=\frac{\pi}{4}(d_2)^2=\frac{\pi}{4}(0.40)^2=0.125m^2$	½	
		from continuity equation,		
		$a_1v_1= a_2v_2$	½	
		$0.031\ v_1= 0.125\ v_2$		
		$v_1= 4\ v_2$	½	
		By using Bernoulli's equation,		
		$\boxed{\frac{P_1}{\gamma}+\frac{v^2_1}{2g}+Z_1=\frac{P_2}{\gamma}+\frac{v^2_2}{2g}+Z_2}$	1	
		$22+\frac{(4v_2)^2}{2x9.81}+0=30+\frac{v^2_2}{2x9.81}+2$		
		$22+0.815\ v^2_2=30+0.051\ v^2_2+2$		
		$\boxed{v_2= 3.617m/s}$	1	
		$\therefore Q = a_2v_2$		
		$\boxed{Q = 0.125x3.617 = 0.452\ m^3/sec}$	1	6

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.5	b)	Two reservoir are connected by a pipeline consisting of two pipes ,one of 10 cm diameter and length 6m and other of 20 cm diameter and 16 metre length .if the difference of water level in two reservoir is 6m, calculate discharge.		
	Ans.	Given- h_L =6m, d_1=10cm = 0.10m, d_2 = 20cm = 0.20m L_1=6m, L_2=16m ***Note: Assuming value of friction factor = 0.01*** 		

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.5	b)	Find : Q= discharge flowing through pipe Total head loss = Entrance loss + Friction loss + Sudden expansion loss + Friction loss +Exit loss	½	
		By continuity equation, $A_1V_1 = A_2V_2$	½	
		$\frac{\pi}{4}d_1^2V_1=\frac{\pi}{4}d_2^2V_2$ $V_1=\frac{d_2^2}{d_1^2}\times V_2$ $V_1=\frac{0.20^2}{0.10^2}\times V_2$ $V_1 = 4V_2$	½	
		$Now, h_1=\frac{0.5V_1^2}{2g}+\frac{fL_1V_1^2}{2gd_1}+\frac{(V_1-V_2)^2}{2g}+\frac{fL_2V_2^2}{2gd_2}+\frac{V_2^2}{2g}$	½	
		Assume friction factor f=0.01 $6=\frac{0.5V_1^2}{2\times9.81}+\frac{0.01\times6\times V_1^2}{2\times9.81\times0.10}+\frac{(4V_2-V_2)^2}{2\times9.81}+\frac{0.01\times16\times V_2^2}{2\times9.81\times0.20}+\frac{V_2^2}{2\times9.81}$	1	
		$6=0.025V_1^2+0.030V_1^2+0.458V_2^2+0.040V_2^2+0.050V_2^2$ $6=0.055V_1^2+0.548V_2^2$ $6=0.055(4V_2)^2+0.548V_2^2$ $6=0.88V_2^2+0.548V_2^2$ $6=1.428V_2^2$ $V_2^2=4.201$ $\boxed{V_2=2.049m/sec}$	1	
		$V_1=4V_2$ $V_1=4\times2.049$ $\boxed{V_1=8.196m/sec}$	1	
		Discharge, $Q=A_1V_1$ Or $Q=A_2V_2$ $Q=\frac{\pi}{4}d_1^2\times V_1$ Or $Q=\frac{\pi}{4}d_2^2\times V_2$ $Q=\frac{\pi}{4}0.10^2\times8.196$ Or $Q=\frac{\pi}{4}0.20^2\times2.049$ $\boxed{Q=0.064m^3/sec}$ Or $\boxed{Q=0.064m^3/sec}$	1	6
		(*Note: Answer may vary assuming other value of friction factor. ‘f’*)		

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.5	c)	**Water discharge at the rate of 0.09 m^3/sec. through 10 cm diameter vertical sharp edged orifice placed under a constant head of 8m. A point on the jet measured from vena contract of the jet has co-ordinates 4.5m horizontal and 0.54m vertical. Find the coefficients C_c, C_d and C_v of orifice.**		
	Ans.	Given:		
		$Q_a = 0.09 m^3/s$, d = 10cm = 0.10m, h = 8 m, x = 4.5m, y = 0.54m	½	
		Solution:		
		$A = \frac{\pi}{4} \times d^2$	½	
		$= \frac{\pi}{4} \times (0.10)^2$		
		$\boxed{A = 7.85 \times 10^{-3} m^2}$	½	
		$C_d = \frac{Q_a}{Q_t}$	½	
		$= \frac{0.09}{A \times \sqrt{(2gh)}}$		
		$= \frac{0.09}{\left(7.85 \times 10^{-3} \times \sqrt{(2 \times 9.81 \times 8)}\right)}$	½	
		$\boxed{C_d = 0.915}$	½	
		$C_v = \frac{x}{\sqrt{(4hy)}}$	½	
		$= \frac{4.5}{\sqrt{(4 \times 8 \times 0.54)}}$	½	
		$\boxed{C_v = 1.082}$	½	
		$C_d = C_c \times C_v$	½	
		$C_c = \frac{C_d}{C_v} = \frac{0.915}{1.082}$	½	
		$\boxed{C_c = 0.845}$	½	6

Model Answer: Winter - 2019

Subject: Hydraulics **Sub. Code: 22401**

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q. 6		**Attempt any TWO of the following**		12
	a)	**What are major and minor loss of head in flow through Pipes ? Write any two equations of minor loss.**		
	Ans.	**Major loss:** The major loss of head is caused due to friction when fluid flow through a pipe.	1	
		Minor loss: - The minor loss of head are caused due to change in velocity of flowing fluid either in magnitude or direction.	1	
		1. Loss of head due to sudden expansion - $h_e = (V_1 - V_2)^2/2g$ **2. Loss of head due to sudden contraction -** $h_c = 0.5\ V_2^2\ 2g$ **3. Loss of head at the entrance -** $h_{entry} = 0.5\ V^2/\ 2g$ **4. Loss of head due to exit-** $h_{exit} = V^2/\ 2g$ **5. Loss of head due to bend** $H_L = KV_2^2/\ 2g$ **6. Loss of head due to gradual contraction and expansion** $H_L = (V_1 - V_2)^2/2g$ **7. Loss of head due to obstruction** $h_L = ((A/c_c) \times a) - 1)^2 \times (V_2)^2/2g$ **8. Loss of head due to top pipe fitting** $h_L = (V_1 - V_2)^2/2g$	2 each (any two)	6

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.6	b)	**A trapezoidal channel of most economical section has side slope 1.5 (horizontal): to 1.0 (vertical). It is required to discharge 15 m^3 of water per second with a bed slope 0.5 meter in 3 km. Design the section using Manning's formula. Take coefficient of rogosity as 0.015.**		
	Ans.	Given:- $Q = 15\ m^3/sec$ Bed slope $(S) = \frac{0.5}{3000} = \frac{1}{6000}$, Side slope (n) = $\frac{1.5}{1} = 1.5$ Manning's constant $(N) = 0.015$	1	
		Most economical condition for trapezoidal section having following condition i) $R = \frac{d}{2}$ ii) $\frac{(b+2nd)}{2} = d\sqrt{(1+n^2)}$	1	
		$\frac{(b+2nd)}{2} = d \times \sqrt{(1+n^2)}$ $b + (2 \times 1.5 \times d) = 2 \times d\sqrt{(1+1.5^2)}$ $b + 3d = 3.606\ d$ $b = 0.606d$	1	
		Manning formula $Q = A \times \frac{1}{N} \times (R)^{\frac{2}{3}} \times (S)^{\frac{1}{2}}$	1	
		$A = bd + nd^2$ $= (0.606d) \times d + 1.5d^2$ $A = 2.106\ d^2$ $15 = 2.106d^2 \times \frac{1}{0.015} \times \left(\frac{d}{2}\right)^{\frac{2}{3}} \times \left(\frac{1}{6000}\right)^{\frac{1}{2}}$ $15 = 2.106 \times d^2 \times 66.67 \times 0.629 \times d^{\frac{2}{3}} \times 0.0125$ $(d)^{\frac{8}{3}} = 13.587$ $d = 2.66\ m$	1	
		$b = 0.606d$ $b = 1.612m$	1	6

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.6	c)	**A triangular notch of angle 120^0 is used to measure the discharge. Determine the head over the notch , if discharge is 1500 lits/minute. Assume $C_d = 0.6$**		
	Ans.	Given:		
		$\theta=120^0$, $C_d=0.6$, $Q=1500$ lit/min $=\dfrac{1500\times10^{-3}}{60}=0.025m^3/s$	1	
		$\therefore Q=\dfrac{8}{15}C_d\tan\dfrac{\theta}{2}\sqrt{2g}\times H^{\frac{5}{2}}$	1	
		$0.025=\dfrac{8}{15}\times0.6\times\tan\dfrac{120}{2}\sqrt{2\times9.81}\times H^{\frac{5}{2}}$	2	
		$H^{\frac{5}{2}}=0.010$		
		$\boxed{H=0.159\text{ m}}$	2	6