University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination Spring 2023
Program: B.Sc. in Civil Engineering

Course Title: Principles of Accounting | Course Code: ACN 301

Time: 1 hour | Credit Hour: 2 Hours | Full Marks: 20

Instructions: There are **Three** questions in this paper. **Answer Q no. One (1)** and any **one** from the rest.

(5+5)

1. a. What is accounting? Who are the users of accounting?
   b. Explain the accounting equation.

(5+5)

2. a. Mr. X started his own architecture firm, M. ARC, on July 1, 2022. The following transactions occurred during the month of July.

July 1: Mr. X invested TK 100,000 cash in the business.
2: Purchased some computers for TK 120,000 on account.
3: Paid TK 15,000 for office rent for the month.
5: Performed TK 40,000 of services on account.
15: Received a cash payment of TK 12,500 for services provided on July.

Show the effects of the previous transactions on the accounting equation using the following format.

Assets		=	**Liabilities** +	**Owner's equity**		
Cash +	Account Receivables +	Equipment =	Accounts Payable +	Owner's capital +	Revenue -	Expense

b. **Prepare the journal entries for the following transactions:**

August 1: Mr. Y invested TK 200,000 cash in an IT firm named SOFT IT.
2: SOFT IT performed services of TK 50,000 to its clients.
8: SOFT IT provided employees' salaries of TK 60,000.
9: Mr. Y withdraw TK 20,000 for personal use.
22: SOFT IT purchased supplies TK 2,000 on account.

(5+5)

3. Moon Architecture firm has the following information on May 31,2022:

Cash TK 3,400
Accounts Receivable 4,900
Equipment 64,000
Service Revenue 8,100
Advertising Expense 600
Accounts Payable 800
Notes Payable TK 30,000
Rent Expense 1,200
Maintenance and Repairs Expense 400
Gasoline Expense 2,500
Insurance Expense 400

a. Prepare an income statement.
b. Prepare a balance sheet. [Hints: Owner's capital: TK 41,500]

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Spring 2023
Program: B.Sc. Engineering (Civil)

Course Title: Structural Engineering I | Course Code: CE 311
Time: 1 hour | Credit Hour: 3.0 | Full Marks: 40

ANSWER ALL QUESTIONS. Assume any missing data reasonably.

PART-A

1. a) Draw Influence Line for **[10]**

i) Shear force at just right of support **B** and

ii) Bending moment at **B** and **R**, for the Beam in ***Fig.1***.
where **L**= 36ft. for **odd rolls** and 44 ft. for **even rolls**

b) Calculate the maximum and minimum value of bending moment at **B** and **R** using the Influence Line drawn in **1(a);** for the combination of **[5]**

i) Dead Load = 5 k/ft

ii) Moving Live Load (UDL)= 9k/ft, and

iii) Moving Point Live Load= 60 kip

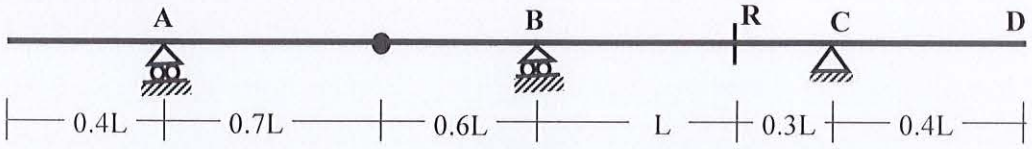

Fig.1

PART-B

2. Draw the shear force and bending moment diagram for the frame shown in ***Fig.2***, where **R**= last two digits of your student No. **[15]**

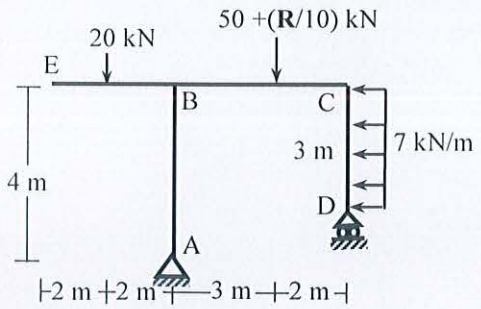

Fig.2

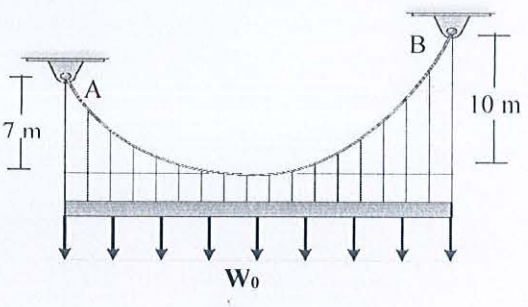

Fig.3

3. A cable is suspended from points **A** and **B** that are (120+ **R**) m apart horizontally as shown in ***Fig.3***. The cable supports the uniform load of w_0 = (25 + **R/10**) kN/m. Determine the maximum and minimum tension in the cable and location of the lowest point of the cable, where **R**=last two digits of your student No. **[10]**

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Spring 2023
Program: B. Sc. in Civil Engineering

Course: Design of Concrete Structures I **Course Code: CE 315**

Time: 1 Hour **Full Marks:40**

Answer all the Questions

Assume any data reasonably If required

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1 a) Explain the differences between WSD and USD methods of design with particular emphasis on how safety is ensured in both the design methods. **(2)**

b) Discuss the behavior of RC rectangular beam in flexure under increasing load by drawing neat sketches for strain and stress distribution of uncracked, cracked and ultimate conditions. **(3)**

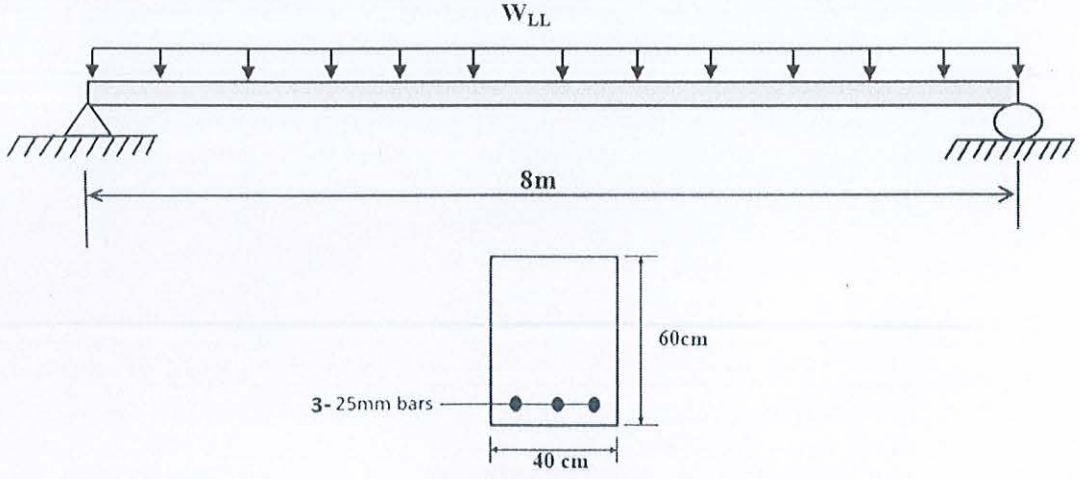
c) Discuss the variation of strength reduction factor(φ) with net tensile strain of steel (ϵ_t) as given in BNBC code. **(2)**

d) Describe the term "Serviceability" in RC design. **(1)**

2 A rectangular beam carries a service live load (unfactored) of 28 kN/m and an unfactored superimposed dead load of 20 kN/m (including it's self weight) on a 7m simple span. The beam will have a cross-section of 300mm x 750mm for architectural reasons. Design the beam for flexure as per safety and environmental considerations.
[fy = 420 MPa, fc′ =28 MPa, β_1 = 0.85, φ=0.9] **(12)**

3 a) Analyze the designed beam of question 2 and determine the stresses of concrete and steel. **(10)**

b) Analyze the section of the beam shown in figure 1 and Compute the uniformly distributed live load "W_{LL}" that will produce first tension crack at the beam. Consider self-weight of the beam as dead load. [fy = 420 MPa, fc′ =28 MPa] **(10)**



Cross section of the beam

Figure 1:RC Rectangular Beam

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Spring 2023
Program: B. Sc. Engineering (Civil)

Course Title: Environment Engineering I — Course Code: CE 331
Time- 1 hour — Full marks: 60

There are **Two** questions. Answer all the questions. *(30*2 = 60)*
[Assume reasonable data if any]

1. (a) A municipality is dependent on groundwater as the source of drinking water. However, the water from tubewell is consuming too much soap. Explain the problem of the water and elaborate what kind of treatment will solve the problem. Provide the details of the option you would recommend (for treatment) including the treatment unit/chemical to be utilized and the process of treatment. Also comment if any treatment option could provide any additional benefit. (6+6)

OR

The municipality requires a treatment plant. Deliver the following:

i) If you want to remove settleable solids, suspended and colloidal solids, explain which treatment units you would employ for the removal of respective contaminants showing in a flow chart.

ii) Consider a source that has no suspended solid or turbidity, what are the steps would you take or which units would you employ for distribution? Explain and Show in a flow chart.

(b) For considering filtration unit, deliver the following:

i) Discuss which media will you use as the most commonly utilized media in filtration with justification. (3)

ii) Explain how the mechanism of "electrostatic attraction" works in the filtration process within this media. (5)

iii) Compare different types of filters with respect to the applicability, media usage, removal efficiency, contaminant removal, cleaning mechanism and cost. (8)

iv) If your water has 35 NTU, which filtration unit would you use? Would you recommend any pre-treatment, which type? (2)

2. (a) Briefly explain the followings- (2+2+2 = 6)

i. Flowing artesian well
ii. Interference of wells
iii. Grey water

(b) In a largely populated city like Dhaka, if you are to select a water source, would you prefer groundwater or surface water? Justify your answer with respect to water availability, transportation and treatment requirement. (6)

(c) Coefficient of permeability of a soil layer is 8×10^{-4} m/s, head of the piezometric surface in the confined aquifer is 300 m, static head is 150 m, depth of confined aquifer is 100 m, radius of zone of influence is 120 m and well diameter is 20 cm. (6)

Determine the well discharge.

$[\ Q = \frac{2\pi Km\ (D-d)}{ln\ (R-r)}]$

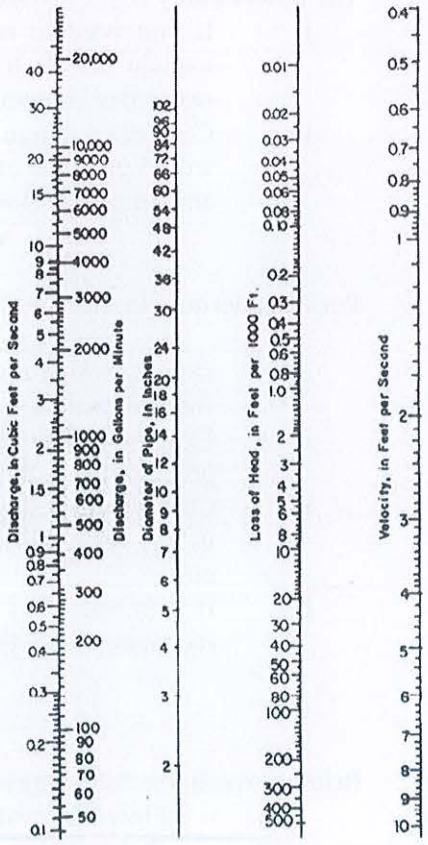
(d) Mention at least three desirable qualities of pressure pipes and provide examples of pipe materials for each qualities that would possess the qualities (6)

(e) A 14" new cast iron pipe is discharging 3.5 ft^3/s. What are the loss of head per 1000 ft and the velocity of water? (6)

[Q is proportional to C]

Hazen William's Nomograph for C=100 is attached below.

C value	Type of conduit
140	Smooth lined steel pipe, very smooth concrete and for smooth new cast iron pipe
130	Ordinary cast iron pipe in good condition
120	Cast iron pipe (5 years old), welded steel pipe
110	Cast iron pipe (10 years), new unlined riveted steel pipe
100	Cast iron pipe (15 to 20 years)
95	Unlined riveted steel pipe in service



University of Asia Pacific
Department of Civil Engineering
Midterm Examination Spring-2023
Program: B.Sc. Engineering (Civil)

Course Title: **Geotechnical Engineering I** Course Code: **CE 341**
Time: 1 hour Credit Hour: 3.0 Full Marks: 60

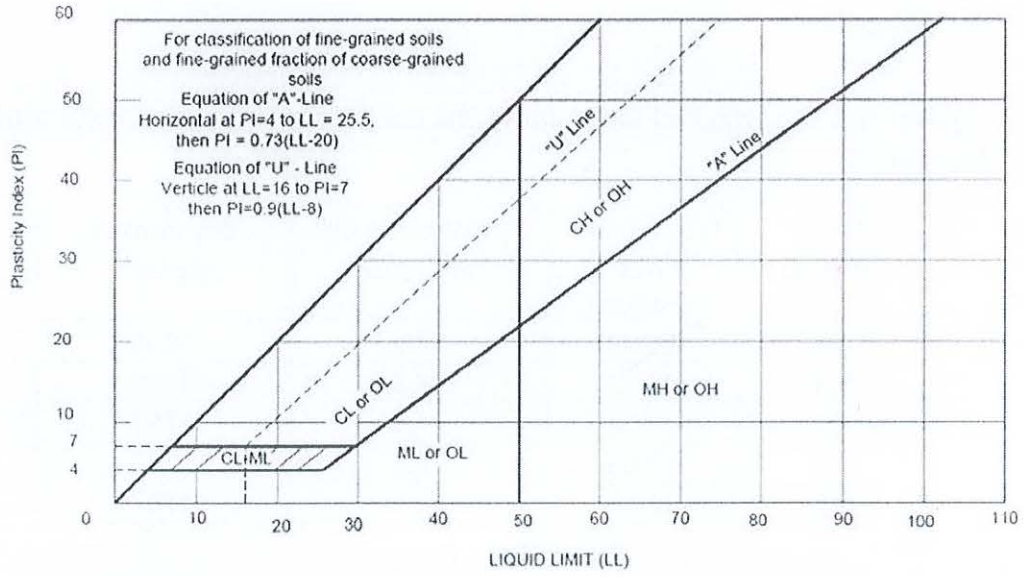
[Answer all the questions. Digits in the right margin inside the 1st parentheses indicate marks]

1. The results of the sieve analysis & plasticity tests of a soil are as follows:

Percent passing through the No. 4 sieve =53%
Percent passing through the No. 200 sieve =8%
Diameter corresponding to 60% finer = 5mm
Diameter corresponding to 30% finer = 1.2mm
Diameter corresponding to 10% finer = 0.2mm

The liquid and plastic limit of the soil are 34% and 18%, respectively.

Mentioning group symbol and group name, classify the soil by the Unified Soil Classification System. (10)



2. The unit weight of a soil after drying in oven is found as 17.8 kN/m³. In field condition it was found that the soil had an air content of 18%. If the specific gravity of the soil solid is 2.68, then find the following_ (10)
   a) Field moisture content.
   b) Porosity.
   c) Moist, saturated & effective unit weight.

3. During hydrometer analysis of a silty clay sample using **152H hydrometer** the reading of the hydrometer observed at elapsed time of 1hr is 21. The suspension was prepared using 65gm dry soil sample in 1000cc water. The temperature of lab room at that time was 19°C. If the viscosity and density of water at 19°C is 0.0825Ns/m^2 and 0.97642 g/cc respectively, then compute the value of particle size(diameter) and percent finer (%) at that specific time.

[Given that, Gs=2.71; Volume of Hydrometer= 47.8 cm^3; Area of cylindrical jar=23.5cm^2; Temperature correction=1.04; Zero or deflocculating agent correction=0.93; Meniscus correction= 0.53] (10)

[For 152H hydrometer,

$$D=\sqrt{\frac{18\mu}{(G_s-1)\gamma_\omega}\frac{z_r}{t}}\ ;\ N=\frac{aR_c}{W_s}x100\%\ ;\ a=\frac{1.65Gs}{2.65(Gs-1)}$$

$Zr=L_1+L_2/2-V_H/2A_j$; $Zr(cm) = 16.31-0.1641R$]

4. Write short note on ___ (4+4+2=10)

   a. Aeolian soil.
   b. Residual soil deposits.
   c. Shrinkage limit.

5. For a given soil, the attached table shows the results of compaction tests conducted in the laboratory. (20)

Wt. of can(gm)	Wt. of can + wet soil(gm)	Wt. of can + dry soil(gm)	Dry density (kg/m^3)
10	35.98	33.2	1666
9.9	38.29	34.8	1726
10	37.96	34.1	1757
9.8	37.06	32.9	1753
9.9	38.46	33.7	1707

i) Determine the maximum dry density of compaction and the optimum moisture content with the help of the following graph.

ii) Draw zero air void line on the same plot.

iii) If the specification calls for 96% relative compaction in the field then what would be the field moist density at the optimum moisture content?

University of Asia Pacific
Department of Civil Engineering
Mid-term Examination Spring 2023
Program: B.Sc. Engineering (Civil)

Course Title: **Open Channel Flow** Course Code: **CE 361**

Time: **1 hour** Credit Hour: **3.00** Full Marks: **40**

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1. In a drainage channel, water flows with a depth of 1 m and a mean velocity of 3 m/s. The section where this condition occurs is parabolic which has a top width of 4 m. Compute the discharge and the state of flow in the channel based on its Froude number. If elementary waves are created in these channels, determine the speeds of the wavefronts upstream and/or downstream of the parabolic section. **(12)**

2. The depths of flow at a short distance upstream and at the vena contract downstream of a vertical sluice gate in a horizontal rectangular channel are 4 m and 1 m, respectively (***shown in Figure 1).*** The bottom width of the channel is 6 m. Calculate the discharge under the gate. Neglect the energy losses. **(6)**

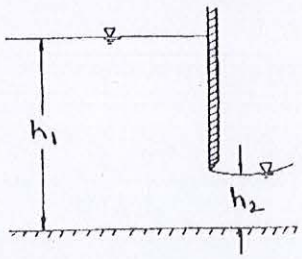


Figure 1

3. In the villages of Monpura Upazilla, triangular canals are often constructed to irrigate rice fields. After the 2023 monsoon flood, one of the canals became filled with coarse debris particles and so its boundary became really rough. The median diameter of the channel bed materials became 8 mm and the side slope was changed to 2H:1V. If the canal produces both normal and critical flow conditions at a depth of 2 m with the changed conditions, determine i) Manning's roughness coefficient, ii) critical slope, iii) drag velocity and iv) the value of k_s for the current condition of the canal. **(14)**

4. A uniform flow of 12.0 m^3/s occurs in a long rectangular channel of 5.0 m width and depth of flow of 1.50 m. A flat hump is to be built at a particular section. Assuming no energy loss, compute the height of the hump and likely change in the water surface to produce critical flow. What will happen if you provide the height of the hump higher than the computed value? **(8)**

Necessary Equations for CE 361

Triangular Section	Trapezoidal Section	Circular Section	Parabolic Section
$A = sh^2$ $P = 2h\sqrt{1+s^2}$ $B = 2sh$ **Rectangular Section** $A = b \times h$ $P = b + 2h$	$A = (b+sh)h$ $P = b + 2h\sqrt{1+s^2}$ $B = b + 2sh$	$h = \frac{d_0}{2}\left[1 - cos\left(\frac{\omega}{2}\right)\right]$ $\omega = 2\,cos^{-1}\left(1 - \frac{2h}{d_0}\right)$ $A = \frac{(\omega - sin\,\omega)d_0^2}{8}$ $B = \frac{d_0}{2}sin(\omega)$ $P = \frac{\omega \cdot d_0}{2}$ *where ω is in radians*	$A = \frac{2}{3} \cdot B \cdot h$ $P = \frac{B}{2}\left[\sqrt{1+x^2} + \frac{1}{x}\ln\left(x + \sqrt{1+x^2}\right)\right]$ where $x = \frac{4h}{B}$

$Q = U_1A_1 = U_2A_2$	$F_r = \frac{U}{\sqrt{gD}}$	$R_e = \frac{UR}{\upsilon}$
$\rho Q(U_2 - U_1) = F_{p1} - F_{p2} - F_f$	$p = \gamma h\,(\cos\theta)^2$	$p = \gamma h\left(1 \pm \frac{U^2}{gr}\right)$
$\bar{U} = \frac{1}{h}\int_0^h u dz$	$\alpha = \frac{1}{U^3h}\int_0^h u^3 dz = \frac{\sum u^3 \Delta A}{U^3A}$	$\beta = \frac{1}{U^2h}\int_0^h u^2 dz = \frac{\sum u^2 \Delta A}{U^2A}$
$E = h + \frac{\alpha U^2}{2g}$	$Z = A\sqrt{D}$	$Z_c = \frac{Q}{\sqrt{g/\alpha}}$
$u^* = \sqrt{\frac{\tau_0}{\rho}} = \sqrt{gRS_o}$	$n = 0.047{d_{50}}^{1/6}$	$\delta_v = \frac{11.6\upsilon}{u^*}$
Rectangular & Wide channel: $h_c = \sqrt[3]{\frac{\alpha Q^2}{gb^2}} = \sqrt[3]{\frac{\alpha q^2}{g}}$	**For Triangular channel:** $h_c = \sqrt[5]{\frac{2\alpha Q^2}{gs^2}}$	**For Parabolic channel:** $h_c = \sqrt[4]{\frac{27\alpha c Q^2}{32g}}$
For smooth boundary: $\left(\frac{u^*k_s}{\upsilon} \le 5\right)$: $\frac{U}{u^*} = 5.75log\left(\frac{3.64u^*R}{\upsilon}\right)$	**For rough boundary:** $\left(\frac{u^*k_s}{\upsilon} \ge 70\right)$: $\frac{U}{u^*} = 5.75log\left(\frac{12.2R}{k_s}\right)$	**For transition boundary:** $\left(5 < \frac{u^*k_s}{\upsilon} < 70\right)$: $\frac{U}{u^*} = 5.75log\left(\frac{12.2R}{k_s + 3.35\upsilon/u^*}\right)$
$Q = CAR^{1/2}{S_f}^{1/2}$	$Q = \frac{1}{n}AR^{2/3}{S_f}^{1/2}$	$Q = \sqrt{\frac{8g}{f}}AR^{1/2}{S_f}^{1/2}$

University of Asia Pacific
Department of Civil Engineering
Program: B.Sc. Engineering (Civil)
Mid-Term Examination: Spring 2023

Course Title: Hydraulics Lab | Course Code: CE 222
Time: 50 Minutes | Credit Hour: 1.5 | Full Marks: 30

Name: _____ **Section:** _____ **ID:** _____

1. True/False? Write "T" or "F" on the left side of each question. **[05]**

i. Theoretical velocity is always greater than actual velocity.
ii. The slope of the converging portion of the venturi meter is less than the slope of the diverging portion.
iii. At vena contracta, the minimum velocity of flow occurs.
iv. For a horizontal conduit, the elevation head is the same for all the points.
v. Flow measuring devices are used to measure discharge.

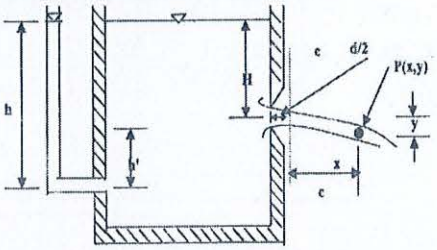
2. Draw qualitative graphs of static head vs. length of the passage, velocity head vs. length of the passage, and total head vs. length of the passage. Also, comment on the relations among these three graphs. **[04]**

3. In a steady flow of water through an orifice, the following data were collected: **[5×2=10]**

Horizontal coordinate(X) = 92 cm	Vertical coordinate (Y) = 48 cm
$C_c = 0.954$,	$C_v = 0.984$
Diameter of Orifice = 1.25 cm	Head Correction = 23 cm

Determine the following:

(i) Theoretical velocity, V_t
(ii) Piezometer reading, h
(iii) Actual velocity, V_a
(iv) Diameter of the flow at Vena Contracta, d_c
(v) Actual Discharge, Q_a



4. An experiment was conducted using water (density is 1 gm/cm^3) for the ***fully submerged*** condition. The data obtained from the experiment is shown in the following. Complete the following table. [Show sample calculations] **[06]**

Inner Radius of Curvature	10 cm	Height of plane surface	10 cm
Width of plane surface	7.5 cm	Distance from pivot to hanger	27.5 cm

y_1 (cm)	y_2 (cm)	F	I_{CG}	M (gm)	y	y_p *(Theoretical)*	y_p *(experimental)*
3.8	13.8			375			

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5. In the experiment of flow through an orifice, the following observations were made. Determine the coefficient of discharge from the V_a vs. H curve. (Use the log-log graph paper attached with the question). Assume reasonable value for missing data. [3+2=5]

Actual velocity V_a (cm/s)	339.1	321.9	376	291.8	354.3
Head Difference, H (cm)	62	54.3	75.0	45.9	67.9