University of Asia Pacific
Department of Civil Engineering
Midterm Examination (Spring 2018)
Program: B.Sc. Engg (3rd year 1st semester)

Course Title: Principles of Accounting **Course: ACN 301** **Credit Hours: 2**
Time: 1 hr **Full marks: 20**

(Answer all the following questions)

1. Zaragoza Company accumulates the following adjustment data at October 31.
   i. Supplies on hand at October 31 total $500.
   ii. Expired insurance for the month is $120.
   iii. Depreciation for the month is $50.
   iv. Services related to unearned service revenue in October worth $600 were performed.
   v. Services performed but not recorded at October 31 are $360.
   vi. Interest accrued at October 31 is $95.
   vii. Accrued salaries at October 31 are $1,625.

Instructions:
Prepare the **adjusting entries** for the items above. [7]

2. Trixie Maye started her own consulting firm, Matrix Consulting, on May 1, 2018. The following transactions occurred during the month of May.

   May 1 Trixie invested $7,000 cash in the business.
   2 Paid $900 for office rent for the month.
   3 Purchased $600 of supplies on account.
   5 Paid $125 to advertise in the *County News*.
   9 Received $4,000 cash for services performed.
   12 Withdrew $1,000 cash for personal use.
   15 Performed $5,400 of services on account.
   17 Paid $2,500 for employee salaries.
   20 Paid for the supplies purchased on account on May 3.
   23 Received a cash payment of $4,000 for services performed on account on May 15.
   26 Borrowed $5,000 from the bank on a note payable.
   29 Purchased equipment for $4,200 on account.
   30 Paid $275 for utilities.

Instructions:

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

	Assets				**Liabilities**		**Owner's Equity**		
Date	Cash	+ Accounts Receivable	+ Supplies	+ Equipment	= Notes Payable	+ Accounts Payable	+ Capital	- Drawings	+ Revenues – Expenses

[7]

(b) Prepare an income statement for the month of May. [3]

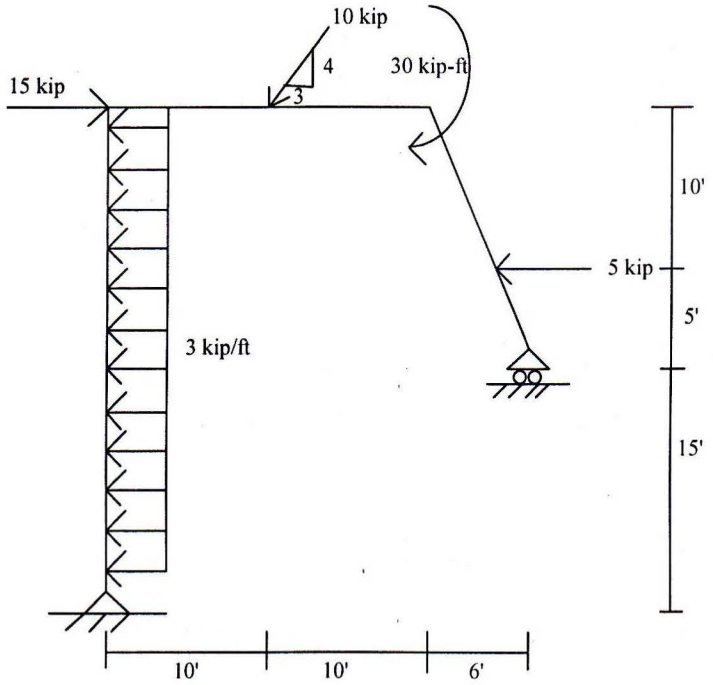
(c) Prepare a balance sheet at May 31, 2018. [3]

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Spring 2018
Program: B. Sc Engineering (Civil)

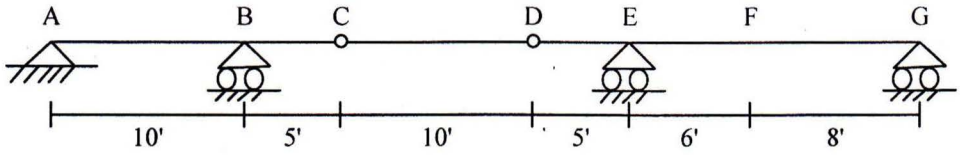
Course Title: Structural Engineering I | Course Code: CE 311
Time: 1.00 Hour | Full Marks: 30 (=3×10)

*There are **four (04)** questions. Answer any **three (03)**.*
Assume any missing data reasonably.

1. Draw the shear force and bending moment diagram for the structure shown in the figure below.

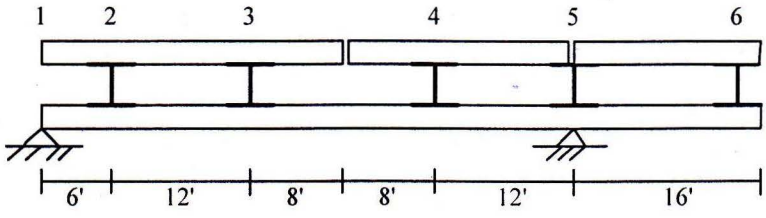


2. For the beam shown below, draw influence line for
(i) Reaction at B, (ii) Reaction at G, (iii) Shear just left of E, (iv) Shear at F, (v) Moment at E.



3. Girder AB supports a floor system as shown in the figure below. Draw influence line for

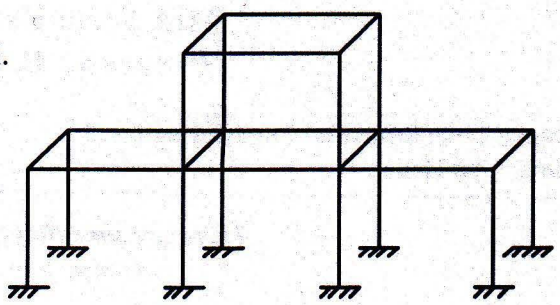
i. Floor beam reaction at panel point 6
ii. Moment at panel point 3
iii. Moment at panel point 4
iv. Shear in panel 2-3



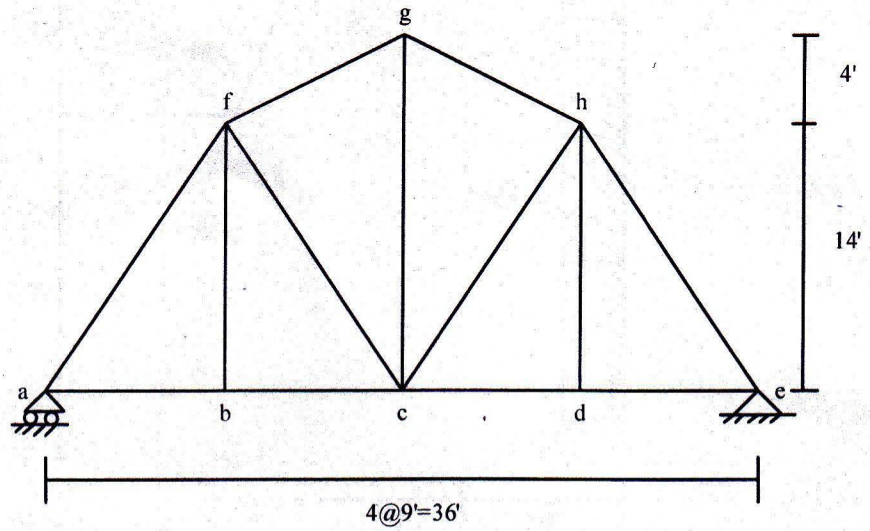
4. a) Determine whether the structures are statically and geometrically stable or unstable. Also calculate the degree of statical indeterminacy. (2)

i.

ii.



b) For the truss shown below, draw influence lines for F_{af} ,F_{fg} F_{cd}. Note, each bottom chord joint consists of a cross girder and load moves over the floor beam placed over the girders. (8)



University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination, Spring 2018
Program: B.Sc. Engineering (Civil)

Course Title: Design of Concrete Structures I — Course Code: CE 315

Time- 1 hour — Full marks: 60

Assume any missing data reasonably.

Answer three (03) questions (1 and 2 compulsory)

Consider material strengths $f'_c = 4\ ksi$ and $f_y = 60\ ksi$ for all cases.

1. a) State the factors which are affecting strength of concrete. (03)

   b) State the number of sources of uncertainty in Analysis, Design and Construction (03)

   c) Differentiate between the WSD and USD method. (04)

   d) A 20 x 24 in. column is reinforced with six No. 11 bars. For this column section, calculate (14)
   (i) the axial load of the column when the concrete stress is 1400 psi;
   (ii) the load on the section when the steel begins to yield;
   (iii) the maximum load if the section is loaded slowly; and
   (iv) the maximum load if the section is loaded rapidly. The area of one No. 11 bar is 1.56 in^2.

2. Analyze the beam using **WSD** method shown in Fig.1 to get uniformly distributed load which will produce crack at tension fiber. The beam has a width of 10 in. and height of 18 in. The tension reinforcement consists of three No.8 bars. (15)

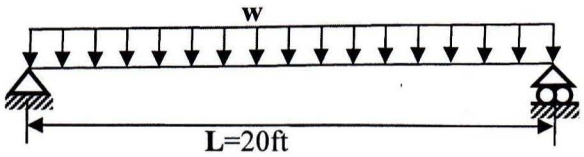


Figure:1

3. Design the Cantilever beam as shown in Fig.2 using **USD** method with proper detailing. (21)

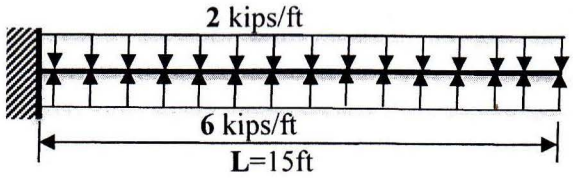


Figure:2

4. Design a beam has limited width of 12 in. and depth 20 in., that subjected to a factored moment 298.4 k-ft. (21)

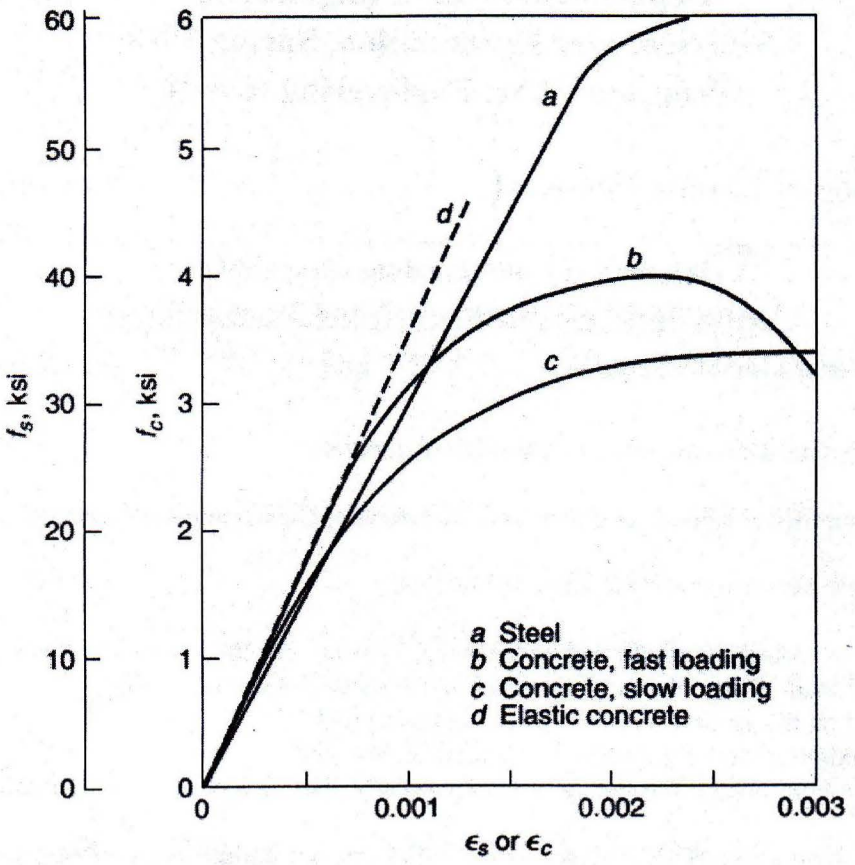


Figure: Concrete and steel stress strain curves.

Formulae:

1. $P_c = f_c A_c + f_s A_{st}$
2. $P_c = f_c[A_g + (n-1)A_{st}]$
3. $P_{nc} = 0.85 f_c' + A_c + f_y A_{st}$
4. $k = -\rho n + \sqrt{\{(2\rho n + (\rho n)^2\}}$
5. $M_c = \frac{1}{2} f_c k j b d^2$
6. $M_s = A_s f_s j d$
7. $a = \frac{A_s f_y}{0.85 f_c' b}$
8. $Mu = \varphi \rho f y b d^2 (1 - 0.59 \frac{\rho f y}{f c'})$
9. $\rho_b = 0.85 \beta_1 \frac{f_c'}{f_y} \times \frac{\epsilon_u}{\epsilon_u + \epsilon_y}$
10. $\rho_{min} = \frac{\sqrt[3]{f_c'}}{f_y} \geq \frac{200}{f_y}$
11. $M_{n1} = (As - As') f_y (d - \frac{a}{2})$
12. $M_{n2} = A_s f_s (d - d')$
13. $Asfy = 0.85 fc' \beta_1 Cb + As' Es \, \epsilon_u \frac{C - d'}{C}$
14. $\bar{\rho}_{cy} = 0.85 \, \beta_1 \, \frac{fc'}{fy} \frac{d'}{d} \frac{\epsilon_u}{\epsilon_u - \epsilon_y} + \rho'$
15. $fs' = Es \, \epsilon_u \frac{C - d'}{C}$
16. $Mn = As \, fy \, (d - \frac{a}{2})$

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Spring 2018
Program: B.Sc. Engineering (Civil)

Course Title: Environmental Engineering I | Course Code: CE 331
Time: 1 hour | Full Marks: 40

Answer any Two (2). Assume data if not available.

1. (a) Show all the elements of a Water Supply System with a neat sketch? **[3]**
   (b) What is an aquifer? Derive the equation of well discharge of an unconfined aquifer. **[3+7]**
   (c) What do you mean by "variations of water demand"? Design population is a governing factor in designing a water supply system. Estimate the design population of a water supply system having a design period of 30 years from 2011, with the following data: **[2+5]**

Year	1961	1971	1981	1991	2001	2011
Population	850500	1010650	1210555	1691550	2077800	2585800

2. (a) What are the factors upon which the viability of an individual alternative water supply option typically depends on? **[3]**
   (b) Draw a neat sketch of a typical pond sand filter (PSF). Discuss the main considerations for selecting a pond while designing a PSF. **[5+5]**
   (c) Classify different types of pumps used in Water Supply Systems. As a water supply engineer, you need to deliver 500,000 gph water from an intake well of a river bank to the treatment plant. Total length of rising main from the intake well to the treatment plant is 1000 ft and the static head is 70 ft. Design the suitable pumping unit with an efficiency of 80%. Assume: Velocity of water in the raising main = 15 fps; Fictional factor = 0.007. **[2+5]**

3. (a) What are the problems you may face while using ground water as a source of water supply? **[3]**
   (b) Explain the factors affecting water demand in a Water Supply System. **[10]**
   (c) Discuss the advantages of rainwater harvesting system as an alternative water supply option. Calculate the amount of rainwater available for a family (5 person) having a roof area of 20 m^2 in the central region of Bangladesh, where rainfall intensity is 2.5 m/yr. Assume a runoff coefficient of 0.70. **[5+2]**

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination
Spring 2018
Program: B.Sc. Engineering (Civil)

Course Title: Geotechnical Engineering I **Course Code**: CE 341
Time: 1 hour **Full Marks**: 20

Answer the following questions. **(6 + 4 + 10 = 20)**

1. Given data:
   $C_u = 2.8$
   $C_c = 1.5$
   Liquid limit = 35%
   Plastic limit = 25%

   (i) In addition to the data given, it is also found that 10% material is finer than 0.075 mm. 1+1
   Calculate the size of the particle from which 60% material is finer.
   Also identify the type of soil.

   (ii) In addition to the data given, it is also found that 60% material is finer than 0.075 mm. 4
   Classify the soil according to Unified Soil Classification System.

2. Calculate the effective stresses at the mid-depth of both the clay layers (Fig. 1). 4

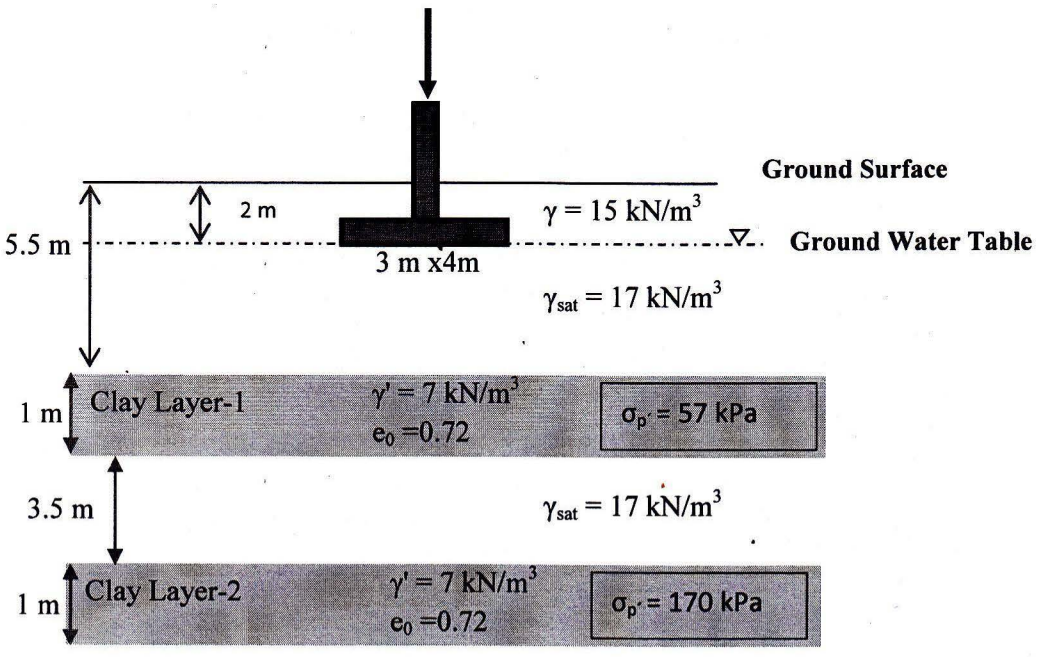


Figure 1

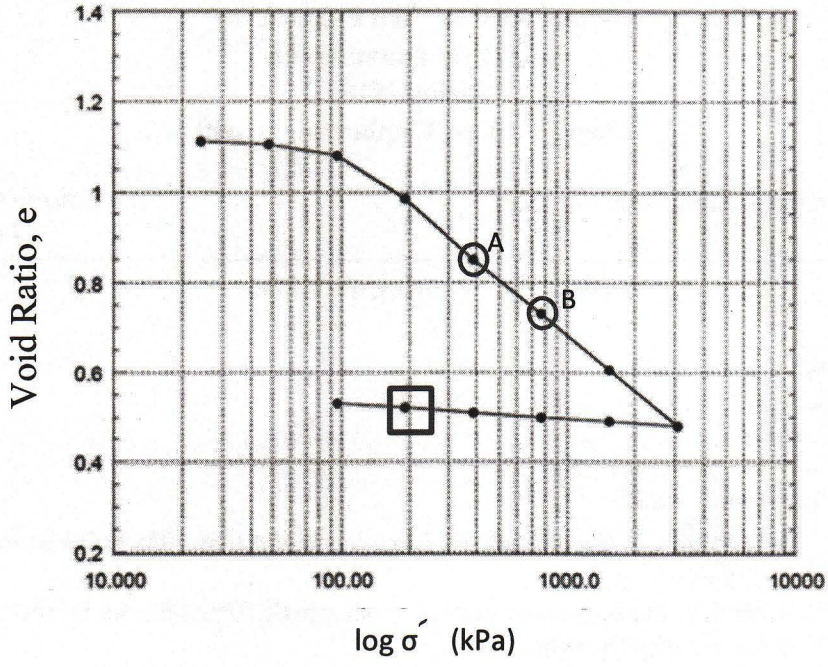


Figure 2

3. The e-logσ' curve (Fig. 2) is drawn from one-dimensional consolidation test results.

(i) Calculate compression index and pre-consolidation pressure (with sketch and labelling). 2

(ii) Calculate over-consolidation ratio at the stress-level marked on the unloading path (Also mention if the soil is in NC or OC state). 1

(iii) Calculate the increase in stress at the mid-depth of clay layer-1 and below the centre of the footing (as shown in Figure 1) under 1000 kN vertical load. Use the influence chart.

(iv) Calculate the primary consolidation settlement of both the clay layers. Use the compression index calculated in question# 3(i) and effective stresses calculated in question# 2. 4
Assume that $\Delta\sigma$ of Clay Layer-1 = 120 kPa
$\Delta\sigma$ of Clay Layer-2 = 80 kPa

(v) Calculate the time required to complete 50% consolidation of the clay layer-1. 3
In the laboratory, the specimen collected from the same layer experienced under the same effective vertical stress in 24 hours 15 mins.

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2018
Program: B. Sc. Engineering (Civil)

Course Title: Open Channel Flow | Course Code: CE 361
Time- 1 hour | Full marks: 60

There are **Three** questions. Answer all the questions. *(20*3 = 60)*
[Assume reasonable data if any]

1. (a) Classify "open channel flow". (4)

(b) Demonstrate how the expressions for velocity distribution coefficients can be derived. (7)

OR

Produce the expressions for Reynolds number and Froude number.

(c) In a wide river the velocity varies along a vertical as u = 3+3z/h, where h is the total depth and u is the velocity at a distance z from the channel bottom. The river is 6 m deep. i) Calculate the discharge per unit width, ii) Calculate the velocity distribution coefficients. (9)

2. (a) State the expression for energy equation with a schematic. Prove the "Law of Torricelli". (9)

OR

A sharp crested weir is placed in a rectangular channel. The upstream depth is 2 m and the downstream depth to the weir is 1.5 m. If the discharge per unit width of the weir is 4 m^2/s, estimate the energy loss due to the weir.

(b) Produce a general expression for Hydraulic Exponent (N) for Uniform Flow Condition using either Manning's or Chezy's Equation. By using the derived expression, compute the numerical value of hydraulic exponent (N) for a wide channel. (11)

OR

Compute the critical depth and velocity in a trapezoidal channel with b = 5 m, s = 1.5, α=1.12 and Q = 30 m^3/s by either bisection method or Newton-Raphson method.

3. (a) State the conditions that are applicable for uniform flow. (6)

OR

Discuss the classification of different types of boundaries on the basis of roughness elements and viscosity.

(b) Define control or control sections/structure with examples. (5)

(c) Water flows at a velocity of 2.0 m/s and a depth of 2.5 m in a long rectangular channel which is 6.0 m wide. Compute the height of a smooth upward step in the channel bed to produce critical flow. Also calculate the change in water level produced by the step. Assume $\alpha = 1.0$. (9)

OR

Water is flowing at a velocity of 2 m/s and a depth of 2.5 m in a long rectangular channel 6 m wide. Figure out the contraction in width of the channel for producing critical flow. Also, examine the change in water level produced by the contraction. Neglect energy losses and take $\alpha = 1$.

Given Formula:

$\bar{U} = \frac{\int_0^A u\, dA}{A}$ $\alpha = \frac{\int_0^A u^3\, dA}{\bar{U}^3 A}$ $\beta = \frac{\int_0^A u^2\, dA}{\bar{U}^2 A}$	Trapezoidal channel $A = (b + sh)h$ $P = b + 2h\sqrt{1+s^2}$ $B = b + 2sh$	Circular Channel $h = \frac{d_o}{2}\left[1 - cos\frac{\omega}{2}\right]$ $\omega = 2cos^{-1}(1 - \frac{2h}{d_o})$ $A = (\omega - sin\omega)\frac{d_o^2}{8}$ $B = d_o \sin\frac{\omega}{2}$ $P = \frac{\omega d_o}{2}$ *Note that ω is in radian*

1. **Hydraulically smooth surface:** $\frac{U}{u^*} = 5.75\, log\, (\frac{3.64u^*R}{\upsilon})$
2. **Hydraulically rough surface:** $\frac{U}{u^*} = 5.75\, log\, (\frac{12.2R}{k_s})$
3. **Transition regime:** $\frac{U}{u^*} = 5.75\, log\, (\frac{12.2R}{k_s + 3.35\frac{\upsilon}{u^*}})$

$u^* = \sqrt{(gRS_0)}$ $\quad$ $K = AR^{2/3}/n$

$Z_c = \frac{Q}{\sqrt{g}/\alpha}$; $\quad$ $Z = A\sqrt{D}$; $\quad$ $Fr = U/\sqrt{(gD)}$; $\quad$. $Re = UR/v$;

Uniform flow formulae:

$U = CR^{1/2}S_f^{1/2}$; $\quad$ $U = \sqrt{(8g/f)}\, R^{1/2}S_f^{1/2}$; $\quad$ $U = (1/n)\, R^{2/3}S_f^{1/2}$

$Z = AR^{2/3}$; $Z = AR^{1/2}$