University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2016
Program: B. Sc. Engineering (Civil)

Course Title: Numerical Analysis & Computer Programming — Course Code: CE 205 (A)
Time: 3 hours — Full Marks: 90

PART–A

Answer **any 4 (FOUR)** of the following questions

1. a) Find the root of the equation $2x^3 + \sqrt{x} - 5 = 0$ by the Newton-Raphson method using the initial approximation of $x_0 = 1$. Use the accuracy of 0.0001. (6)

   b) For the data given below, find the equation to the best fitting exponential curve of the form $y = ae^{bx}$. (6)

x	1	2	3	4	5
y	2	4	8	18	35

   c) Evaluate numerically the following using the Simpson's rule with 10 panels or $n = 10$. (6)

$$I = \int_5^{10} \frac{1}{5} e^{0.5x}\, dx$$

2. a) Determine the root of the equation $x^2 + \ln x - 2 = 0$ between the interval $[1, 2]$ by the Iteration method. Use the accuracy of 0.0001. (6)

   b) For the data given in the following table, determine the value of y when $x = 1.8$. Use the Gregory-Newton forward difference interpolation formula. (6)

x	1	2	3	4	5
y	2.7	7.4	20.1	54.9	148.3

   c) Evaluate numerically the following using the 4 point Gauss Quadrature. (6)

$$I = \int_0^{\pi} (x + \sin x)\, dx$$

Table 1: Gauss points and weight factors for integration

n	x_i	w_i
4	$x_1 = +0.86114$	0.34785
	$x_2 = +0.33998$	0.65215
	$x_3 = -0.33998$	0.65215
	$x_4 = -0.86114$	0.34785

3. a) Solve the following systems of linear equations using the Gauss-Seidel method assuming the initial values $x_0 = 0, y_0 = 0$, and $z_0 = 0$. Use the accuracy of 0.0001. (6)

$$5x + 3y - z = 10$$
$$x + 6y + 2z = 8$$
$$2x - y + 4z = 12$$

b) Solve the following differential equation to get $y(1)$ by the Euler's method which has an initial value $y(0) = 1$. Use the step length, $h = 0.25$. (6)

$$\frac{dy}{dx} = \frac{2x + 5}{y^2}$$

c) Derive the trapezoidal rule formula to evaluate an integral. (6)

4. a) Solve the following boundary value problem to estimate $y(1)$ by the Finite Difference method with step length, $h = 1$. (6)

$$5\frac{d^2y}{dx^2} - 8y + 11 = 0$$

Given that,

$$y(0) = 1$$
$$y(2) = 4$$

b) What are the types of error that you may encounter in numerical analysis? Give short description of each with appropriate examples. (6)

c) Determine $y(0.8)$ by solving the following differential equation using the Predictor-Corrector method (Milne's method). Use the accuracy of 0.0001. (6)

$$3\frac{dy}{dx} = x - 2y^2$$

Given that,

$$y(0) = 0$$
$$y(0.2) = 0.3$$
$$y(0.4) = 0.8$$
$$y(0.6) = 1.7$$

5. a) Find $y(1)$ by solving the following differential equation using the fourth-order Runge-Kutta (RK4) method which has an initial value $y(0) = 1$. Use the step length, $h = 0.5$. (9)

$$\frac{dy}{dx} = \frac{x^2 + 2}{4y}$$

b) For the data given in the following table, determine the value of y, when $x = 3$ using the Lagrange interpolating polynomial formula. (9)

x	1	2	4
y	4	9	25

PART–B

Answer **any 3 (THREE)** of the following questions

13. Write an algorithm to find the real root of a quadratic equation ($ax^2 + bx + c = 0$). (6)

14. Write a C++ program to calculate the summation of the following series. (6)

$$2^2 + 4^2 + 6^2 + 8^2 + \ldots\ldots + n^2$$

15. Write an algorithm to determine the greatest of given three numbers. (6)

16. Write the output of the following *for* loop. The first two are done for you. (6)

```
int main ()
{
   int count = 0;
   for (int i = 1; i < 6; i++)
   {
     for (int j = i; j < 6; j++)
     {
     count + = i * j;
     cout<<"i = "<<i<<""<<"j = "<<j<<""<<"count = "<<count<<endl;
     }
   }
}
```

Sample output:

```
i = 1     j = 1     count = 1
i = 1     j = 2     count = 3
```

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2016
Program: B. Sc. Engineering (Civil)

Course Title: Numerical Analysis and Computer Programming | Course Code: CE 205(B)
Time: 3.00 Hours | Full Marks: 150

Section A

*There are **twelve (12)** questions in this section. Answer any **ten (10)**.*
Assume any missing data reasonably.

1. Evaluate numerically [12]

$I = \int_0^{0.5} \frac{x}{cosx} dx$

Using Gauss Quadrature with 3 points or n=3

Table: Gauss points and weight factors for integration

n	Gauss points, x_i	Weight factors, c_i
3	$x_1 = +0.7745966692$	0.5555555556
	$x_2 = 0.0$	0.8888888889
	$x_3 = -0.7745966692$	0.5555555556

Equation for the conversion of integral over [a,b] to integral over [-1, 1]

$\int_a^b f(x)dx = \frac{b-a}{2} \int_{-1}^{1} f(\frac{b-a}{2}x + \frac{b+a}{2})$ dx

2. Solve the differential equation $\frac{d^2y}{dx^2} = e^{x^2}$ at x=0.25 and x=0.5 using finite difference method. Given that y(0)= y(1)=0. [12]

3. Evaluate numerically [12]

$I = \int_3^7 x^2 \, logx$ dx

using both trapezoidal and Simpson's rule with four equal panels.

4. Use 4th order Runge-Kutta method to estimate y (0.2) , when [12]

$\frac{dy}{dx} = y^2 + 1$, with y=0 at x= 0.

5. (a) Solve the following system of linear equations using Gauss-Seidel method. [10]

7m-2n+3p=6
-3m+2n+6p=2
m+5n+3p=-5

use m=0.5, n= -1, p =1 as approximate solutions. Correct the results up to three significant

figures.

(b) If you had used Jacobi method, would you have required fewer iterations? Why or why not? [2]

6.(a) Given $\frac{dy}{dx} + \frac{2x}{y} = y$ with y (0) =1. Use Euler's method to estimate y(0.3) & y(0.25). [9]

(b) Mention the difference between Euler's method and Heun's method for solving ordinary differential equations. [3]

7. Many salts show a large increase in solubility with the increase of temperature. A few, such as cerium (III) sulfate, become less soluble in water as temperature increases. This temperature dependence is sometimes referred to as retrograde or inverse solubility. Following table shows solubility of cerium(III) sulfate in water at a variety of temperatures (in degree Celsius) [12]

Temparature (°c)	Solubility (g per 100g water)
0	18
20	10
30	8
45	7
60	4
80	2

Find the least-square values for the parameters of $y=ae^{bx}$ by fitting the data where x is independent and y is dependent variable.

8. (a) Write short note on [4]

(i) Round off error
(ii) Truncation error
(iii) True error
(iv) Relative Approximate error

(b) Find the root of the equation $2x = \cos x + 3$ by iteration method. Use initial guess x=1.57. Show the result up to three decimal places. Allow relative approximate error maximum 0.1%. [8]

9. From the following table of values of x and y obtain, $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for x=2.6 [12]

x	2.6	4.1	5.6	7.1
y	3	14	41	56

10. (a) How do you decide initial guess values for solving a polynomial equation using bracketing method? [2]

(b) Find the root of the equation $1-xe^x=0$ by bisection method between the interval [0,1]. Correct the result up to two significant figures. [10]

11. Fit a cubic polynomial through the first four points of the following table using Lagrange's interpolation formula and use it to find the interpolated value for x=10 [12]

x	5	6	9	13	16
y	14	28	35	48	57

12.(a) Derive Gregory-Newton forward difference interpolation formula. [10]

(b) Define Numerical method. [2]

Section B

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

13. Write a program that will produce the following output: [10]

1
12
123
1234
12345
123456
1234567
12345678

14. Write a program that will determine the real roots of a quadratic equation. [10]

[Note: Standard form of quadratic equation: $ax^2+bx+c=0$. Library function sqrt ( ) can be used to find the square root of a number. The sqrt ( ) function is defined in math.h header file.]

15. Write a program using array that will provide total marks of each student in Computer programming Course. [Note: Total marks will be in 100 and mark distribution will be 30% of Class test, 30% of midterm exam and 40% of final exam] [10]

Registration Number	Class Test (Out of 100)	Midterm Exam (Out of 100)	Final Exam (Out of 100)
15105091	83	65	70
15105092	78	58	61
15105093	89	73	70
15105094	92	69	65
15105095	72	46	73
15105096	80	51	49
15105097	73	58	59

16. Write down the output of the following program. [10]

```
#include <iostream>
using namespace std;
int main ( )
{
 int x = 9;
do
  {
   cout << "value of x: " << x << endl;
    x = x + 2;
  }
while( x < 21 );
  return 0;
}
```

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall-2016
Program: B.Sc. Engineering (Civil)

Course Title: Fluid Mechanics | Course Code: CE 221
Full Marks: 150 | Time: 3 hours

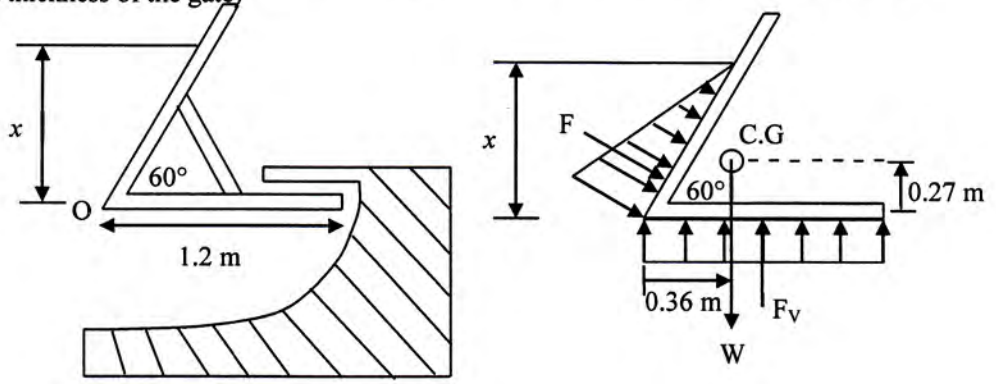
Section A

[There are **four (04)** questions in this section. Answer any **three (03)** of them.]

1. (a) Derive the equation of hydrostatic pressure variation in a static fluid. (10)

   (b) A circular door of 1.5 m diameter closes an opening in the vertical side of a bulkhead, which retains sea water. The center of the opening is at a depth of 2.5 m from the water level. Determine the total pressure force on the door. Take the specific gravity of sea water to be 1.05. (05)

   (c) A gate weighing 2.224 kN is 0.6 m wide perpendicular to the following figures. It pivots around O and has its centre of gravity at 0.36 m to the right and 0.27 m above O. For what values of water depth x above O, will the gate remain closed? (Neglect friction at O and thickness of the gate) (10)

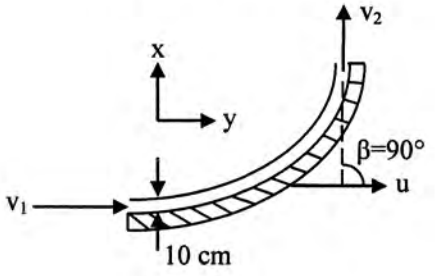


2. (a) Derive the Impulse Momentum equation. (10)

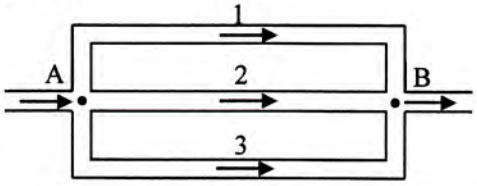
   (b) Write down three practical applications of Impulse Momentum equation. (03)

   (c) For the single moving vane shown in the figure below: (12)
   - i. Draw the velocity vector diagram at entrance and exit.
   - ii. Calculate the resultant of force due to water jet.
   - iii. Calculate the rate of work done on the vane by the water jet.

   Assume: $\beta = 90°$, $v_1 = 45$ m/s, $u = 30$ m/s, Initial diameter of stream = 10 cm. (Neglect friction)



3. (a) For the parallel pipe connection shown below, the following information are given: (12)
$L_1 = 600$ m, $d_1 = 200$ mm, $f_1 = 0.018$; $L_2 = 1200$ m, $d_2 = 400$ mm, $f_2 = 0.019$; $L_3 = 900$ m, $d_3 = 300$ mm, $f_3 = 0.021$.
For a discharge of 0.34 m^3/s, determine the flow rate through each pipe and head loss due to friction between A and B.



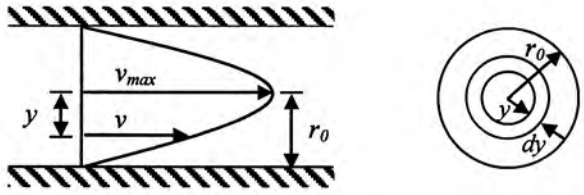
(b) Three pipes are connected in series. The following information are given for the pipe connection (08)

$L_1 = 500$ m, $d_1 = 25$ cm; $L_2 = 850$ m, $d_2 = 30$ cm; $L_3 = 450$ m, $d_3 = 45$ cm.

If the connection is to be replaced by a pipe of uniform diameter, find the diameter of the new pipe, assuming the total length to remain the same. Also assume the friction factor to be uniform for both arrangements.

(c) When are two pipes called equivalent? Write down the adverse effects of cavitation. (05)

4. (a) The velocity profile shown in the following figure of a circular pipe of radius r_0 is given by the equation: $v/v_{max} = [1-(y/r_0)^2]$ (15)



Determine the Boussinesq coefficient (β) for the above velocity profile.

(b) Define the following terms: (10)
(i) Specific gravity (ii) Specific volume (iii) Viscosity (iv) Surface tension

Section B

[There are **four (04)** questions in this section. Answer any **three (03)** of them.]

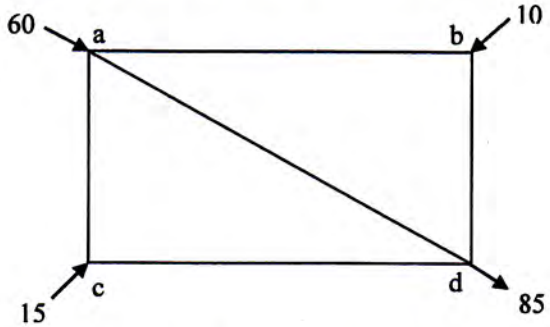
5. (a) State and prove Bernouli's equation. What are the assumptions of this equation? (10+5)

(b) A certain lubricating oil is flowing through a horizontal pipe at the rate of 20 L/s. The kinematic viscosity of the oil is 1.98×10^{-4} m^2/s and its specific gravity is 0.94. If the head loss due to friction is 25 m for 350 m of length, find the diameter of the pipe. (10)

6. (a) Write short notes on : (5)
   i) Reynold's number
   ii) Hydraulic radius
   iii) Flow rate & mean velocity

(b) Prove that, for a flow in Laminar condition, $f = \frac{64}{R_e}$ (10)

(c) Determine the distribution of flow in the pipe network shown below. The flows are in liters/sec.Use Hardy Cross method. (10)



7. (a) Derive Darcy-Weisbach equation.What are the limitations of this equation? (10+5)

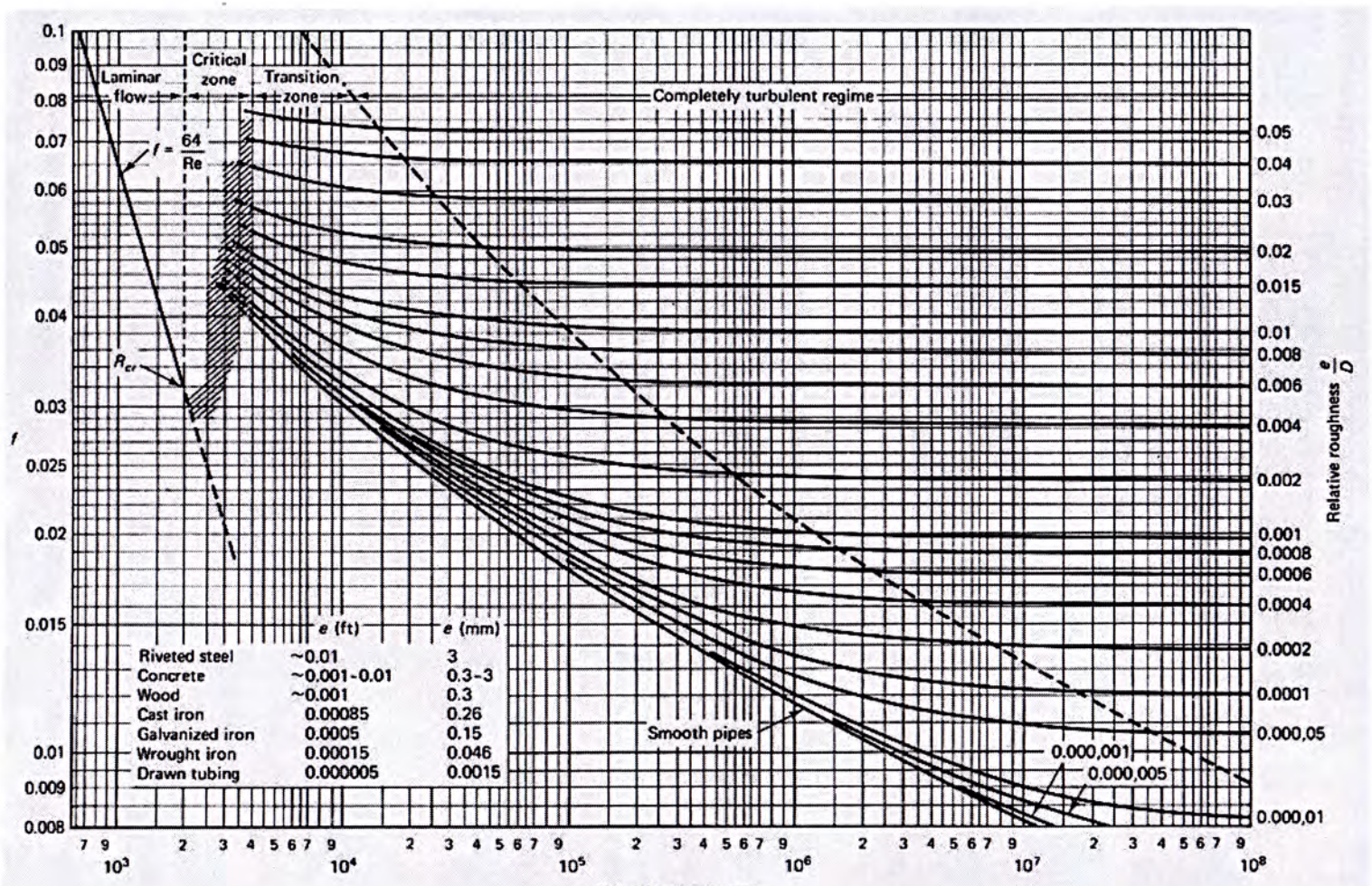
(b) Water at 22° C flows in a 25 cm radius cast iron pipe. If head loss per unit length is 0.006, find the discharge and the thickness of viscous sublayer. (10)

8. (a) Briefly discuss the following terms: (12)
   i) Laminar flow
   ii) Viscous sublayer
   iii) Hydraulically smooth surface
   iv) Moody diagram

(b) Graphically show the relationship between shear stress and velocity gradient. (2)

(c) Discuss the effect of temperature on viscosity. (2)

(d) A 40 m long pipeline is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25 m of its length from the tank, the pipe is 15 cm in diameter and its diameter suddenly enlarges to 30 cm. The height of water level in the tank is 8 m above the center of the pipe. Considering all the head losses that occur, determine the rate of flow. Assume, $f = 0.020$ for both the pipes. (9)



Moody diagram. (From L. F. Moody, *Trans. ASME*, Vol. 66, 1944.)

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination Fall 2016
Program: B. Sc. in Civil Engineering

Course Title: Mathematics-IV | Course Code: MTH 203
Time: 3.00 Hours. | Full Marks: 150

There are **Eight** questions. Answer any **Six**. All questions are of equal value/figures in the right margin indicate marks.

1. Evaluate $\mathcal{L}^{-1}\left\{\frac{5}{(s+3)(s^2+1)}\right\}$ by using Convolution theorem. Verify the result by evaluating it by partial fraction method. **12+13**

2. (a) Suppose $F(t) = \begin{cases} t^2 & , 0 < t < 1 \\ 0 & , 1 < t < 2 \end{cases}$ which has a period 4 **13**

(i) Graph the function
(ii) Find Laplace transformation of $F(t)$

(b) Use Heaviside's expansion formula to find , $\mathcal{L}^{-1}\left\{\frac{3s^3+s+1}{(s^2-4)(s^2-1)}\right\}$ **12**

3. (a) Solve using Laplace transformation : $Y''(t) + Y(t) = t,\ Y(0) = 1, Y'(0) = -2$ **13**

(b) Find Laplace transformation of the following functions: **12**

(i) $F(t) = (t+2)^2 e^t$

(ii) $F(t) = \frac{\cos(at) - \cos(bt)}{t}$

4. (a) Solve the Cauchy-Euler equation: $(3x^2D^2 + 2xD - 4)y = 0$ **13**

(b) Solve the differential equation: $(D^2 - 3D + 2)y = e^{2x} + \sin(3x)$ **12**

5. (a) Solve the Bernoulli's equation: $x\frac{dy}{dx} - (1+x)y = xy^2$ **15**

(b) Solve the following differential equations: **10**

(i) $(D^4 - D^3 - 6D^2)y = 0$

(ii) $(D^4 - 16)y = 0$

6. (a) Suppose that salt is entering the tank at the rate 5 lb per minute and leaving the tank at the rate $0.0A\ lb$ per minute, where $A(t)lb$ per minute is the amount of salt in the tank at time t. There was $100lb$ salt dissolved in the tank initially. **15**

(i) How much time is needed for the salt to be double?

(ii) How much salt will be in the tank after 6 hours?

(b) Solve the differential equation : $p^2 + 2xp - 3x^2 = 0$ **10**

7. (a) Find the Fourier Series of the function **15**

$$f(x) = \begin{cases} 0 & , -\pi \le x \le 0 \\ x & , \ 0 \le x \le \pi \end{cases} \quad \text{having } period\ 2\pi.$$

(b) Find Fourier integral of the function $f(x) = e^{-kx}$ when $x > 0$ and $f(x)$ is an odd function. Hence show that $\int_0^\infty \frac{\lambda \sin(\lambda x)}{k^2+\lambda^2}\, d\lambda = \frac{\pi}{2} e^{-kx}$ for $k > 0$ **10**

8. (a) Find finite Fourier Cosine transform of $\frac{\partial U}{\partial x}$. **5**

(b) Use Finite Fourier Sine transform to solve **20**

$$\frac{\partial U}{\partial t} = \frac{\partial^2 U}{\partial x^2}\ , 0 < x < 4 \ and\ t > 0$$

with conditions $U(0,t) = 0,\ U(4,t) = 0,\ U(x,0) = 2$

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2016 (Set 1)
Program: B. Sc. Engineering (Civil)

Course Title: Mechanics of Solids II | Credit Hours: 3.0 | Course Code: CE 213
Time: 3 hours | Full Marks: 100 (= 10 × 10)

[Answer **any 10 (ten)** of the following 14 questions]

1. Fig. 1(a) shows the first Shaheed Minar built by students (which was soon destroyed by the then-government).

   It is represented by the monument *ABCD* [Fig. 1(b)] composed of square-shaped cross-sections [Fig. 1(c)].

   The monument is subjected to the forces F_x and F_y at the corner of *A*.

   If $F_y = 0$, calculate the

   (i) Horizontal force F_x required to cause the torsional rotation of member *AB* to be 1°

   (ii) Maximum normal stress over section *B* for the value of F_x calculated in (i)

   [Given: Shear modulus = 5×10^6 kPa].

Fig. 1(a)

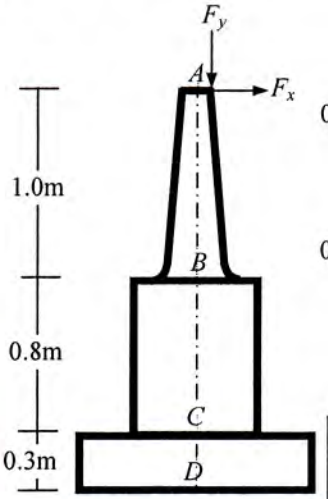


Fig. 1(b)

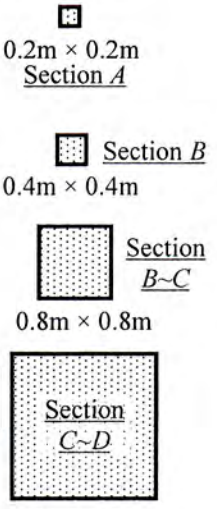


Fig. 1(c)

2. Calculate the force required to overturn the monument *ABCD* [shown in Fig. 1(a)~(c)] weighing 30 kN, if (i) $F_x = 0$, (ii) $F_y = 0$.

3. Draw the Mohr's circle of stresses at the

   (i) Center point of the section at *D*, (ii) Corner point of the section at *D*

   for the monument *ABCD* [shown in Fig. 1(a)~(c)] weighing 30 kN and subjected to $F_x = 30$ kN, $F_y = 0$.

4. Use the Von Mises yield criterion to calculate the yield strength required to avoid yielding of the Helical Spring 1 (shown in Fig. 2) supporting the monument *ABCD* [shown in Fig. 1(a)~(c)] weighing 30 kN

   [Given: Spring coil diameter = 0.02m, Mean diameter of spring = 0.2m].

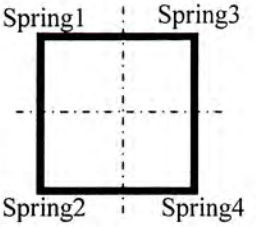


Fig. 2

5. Calculate the equivalent polar moments of inertia (J_{eq}) for the three cross-sections shown in Fig. 3(a)~(c) by centerline dimensions

   [Given: Wall thickness = 0.10′].

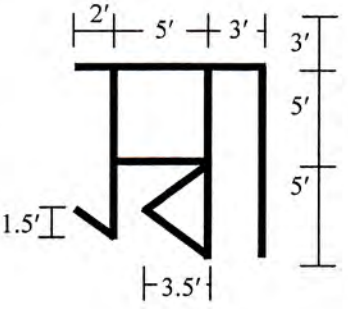


Fig. 3(a)

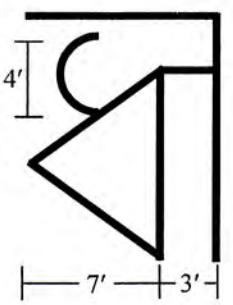


Fig. 3(b)

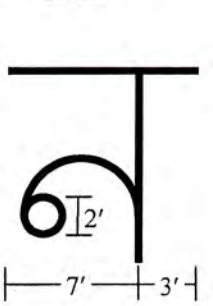


Fig. 3(c)

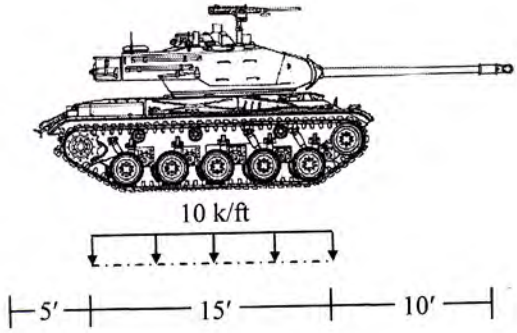


Fig. 4(a)

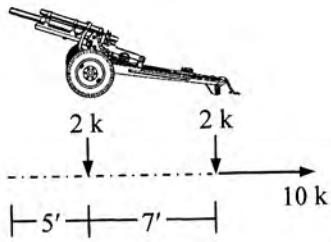


Fig. 4(b)

6. Figs. 4(a) and 4(b) represent loads from two artilleries used by opposing sides during our liberation war.

   For beam *abcde* shown in Fig. 5 carrying loads of Figs. 4(a) and 4(b), use *Singularity Functions* to calculate

   (i) The value of *EI* to make joint *b* deflect 6-inches vertically

   (ii) Rotation at *e*, for the value of *EI* calculated in (i).

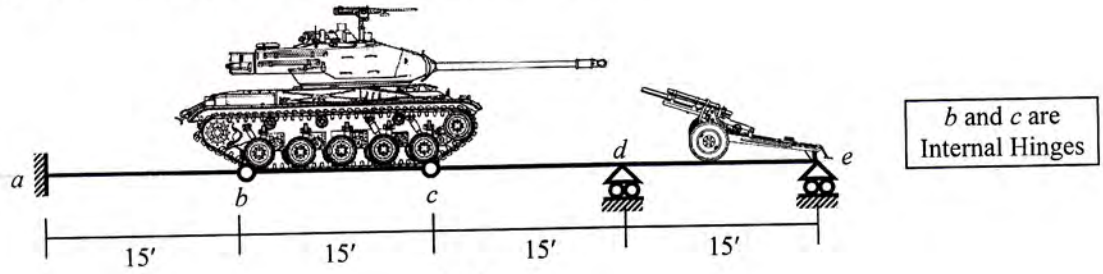


Fig. 5

7. Answer Question 6 using the *Moment-Area Theorems*.

8. Answer Question 6 using the *Conjugate Beam Method*.

9. Fig. 6 shows the statically indeterminate beam *abc* carrying the load shown in Fig. 4(b). Calculate the vertical reaction at support *c* if support *a* also settles 0.10-ft

   [Given: $EI_{ab} = 80 \times 10^3$ k-ft^2, $EI_{bc} = 40 \times 10^3$ k-ft^2].

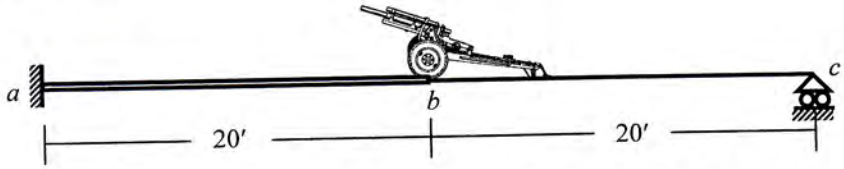


Fig. 6

10. (i) For the beams shown in Fig. 7 and carrying loads shown in Figs. 4(a) and 4(b)
    - Write down the equations for load *w(x)* using singularity functions
    - Draw qualitative deflected shapes.

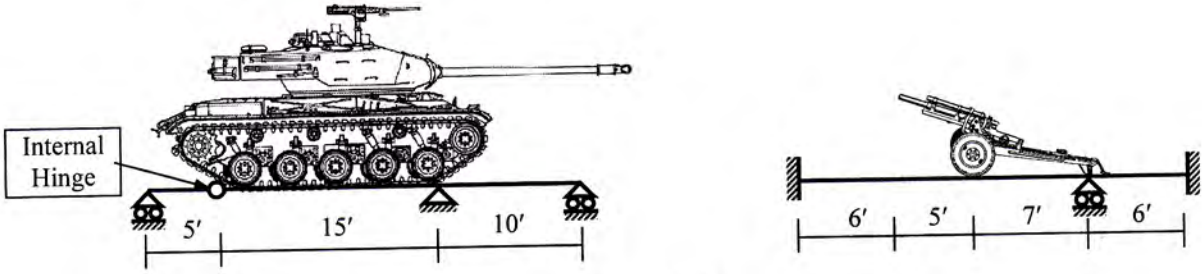


Fig. 7

(ii) Explain why

(a) Explain why columns with initial imperfection deflect transversely at the application of axial force.

(b) Narrate the theoretical limitations of Euler's formulation to calculate the buckling load of columns.

11. Fig. 8 shows a simply supported beam *aob*, initially deflected 1′ at midspan and carrying the loads shown in Fig. 4(a) and Fig. 4(b).

Calculate the

(i) Deflection

(ii) Bending Moment

at midspan (*o*) of the beam *aob*

[Given: $EI = 50 \times 10^3$ k-ft^2].

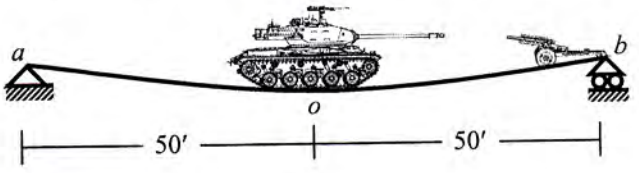


Fig. 8

12. Fig. 9(a) and Fig. 9(b) show two concrete frames *ABCD* subjected to the load shown in Fig. 4(a) on beams *AB*.

Calculate the dimension (*h*) of all frame members [having cross-section shown in Fig. 9(c)] to prevent buckling of columns *AC*, if the frame is

(i) Unbraced [Fig. 9(a)]

(ii) Braced [Fig. 9(b)].

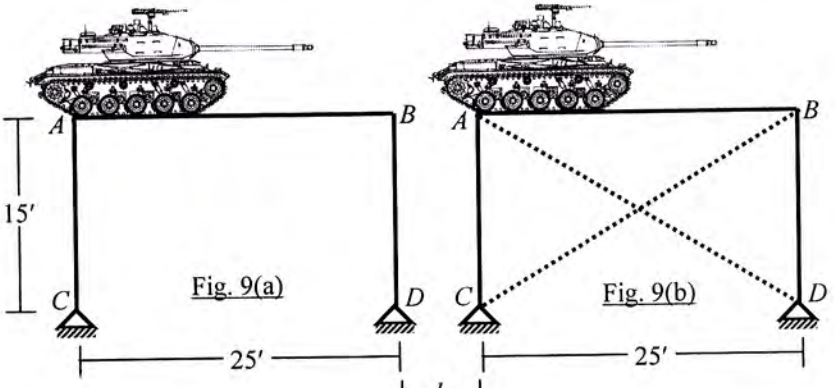


Fig. 9(a)

Fig. 9(b)

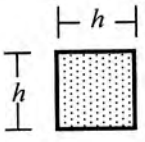


Fig. 9(c)

13. Fig. 10(a) shows the setup arrangement of a machine gun, which is supported on three members *OA*, *OB*, *OC* [with cross-section shown in Fig. 10(b)].

If the supporting members are made of a material whose stress-strain relationship is given by

$$\sigma = 500(\varepsilon)^{0.3}$$

where σ is the stress (MPa), and ε is the strain, calculate the

(i) Critical load for the member *OA*

(ii) Maximum reaction force *F* that the system can endure.

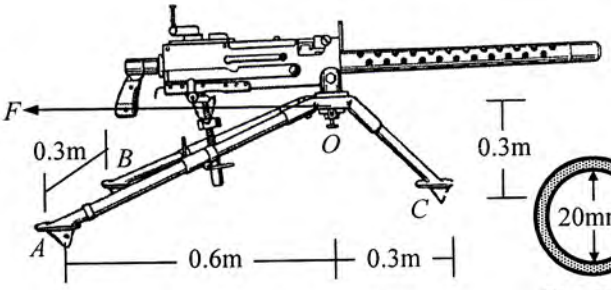


Fig. 10(a)

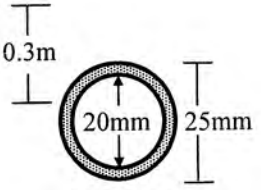


Fig. 10(b)

14. Fig. 11(a) shows a 120m long simply supported span *aob* of a steel bridge, subjected to blast-induced concentrated forces F_0 (applied strategically during our liberation war) acting upward at each bottom-chord joint.

Use AISC-ASD method to determine the allowable value of F_0, considering members across the section *x-x*, if their cross-section is as shown in Fig. 11(b)

[Given: $E = 200$ GPa,
$f_y = 250$ MPa].

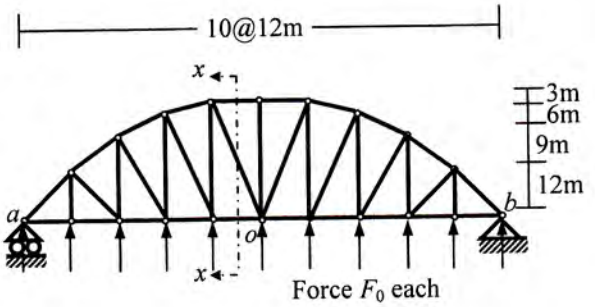


Fig. 11(a)

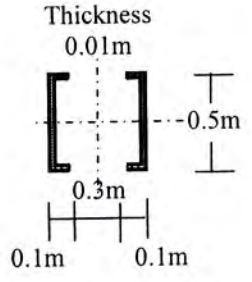


Fig. 11(b)

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall - 2016
Program: B.Sc in Civil Engineering

Course Title: Principles of Economics | Course Code: ECN 201
Time: 2 hours | Full Marks: 50

(Answer any four from the following five questions. Each question has equal marks)

1. a) Define capital intensive process and marginal product.
   b) Write down the formula of calculating average product.
   c) Calculate marginal product and average product for each of the case from the following table:

Labor	Total Product
1	100
2	200
3	250
4	290
5	320

(2+0.5+10)

2. a) Define nominal income and real income.
   b) Write down the formula of calculating real income and real GDP.
   c) Fill in the blanks in the following table for a hypothetical economy.

Year	Output of laptops	Current price	Output at current price	Output at reference year (2009) price	GDP deflator
2009	1000	Tk. 30000	---	---	---
2010	2000	Tk. 40000	---	---	---
2011	3500	Tk. 50000	---	---	---
2012	4500	Tk. 60000	---	---	---
2013	5300	Tk. 70000	---	---	---
2014	6000	Tk. 80000	---	---	---
2015	6500	Tk. 90000	---	---	---
2016	7000	Tk. 95000	---	---	---

(2.5+2+8)

3. a) "Money acts as a means of exchange." –Explain the statement.
   b) Briefly discuss about the supply of money. (4.5+8)

4. a) What do you understand by oligopoly market structure? Discuss with real life example from Bangladeshi perspective.
   b) Briefly discuss the entry barriers for potential competitors in an established industry. (6+6.5)

5. a) What do you understand by GDP?
   b) Write down the formula of calculating NDP (Net Domestic Product) and NY (National Income).
   c) Calculate NDP (Net Domestic Product), NY (National Income), PI (Personal Income), and DI (Disposable Income) from the following table:

Gross domestic product	Tk. 1000000

Consumption of fixed capital	Tk. 10000
Indirect business taxes	Tk. 5000
Social security contributions	Tk. 5000
Corporate income taxes	Tk. 2000
Undistributed corporate profits	Tk. 2000
Transfer payments	Tk. 1000
Personal taxes	Tk. 2000

(1.5+3+8)

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2016
Program: B. Sc. Engineering (Civil)

Course # : CE 203 | Course Title: Engineering Geology & Geomorphology
Full Marks: 120 (6 X 20 = 120) | Time: 3 hours

PART A

There are **four (4)** questions in this section, answer **any three (3)**

1. (a) What is geomorphic process? Classify (mention names only) geomorphic processes based on origin. Write down the names of major geomorphic agents. 5

(b) What are physical and chemical weathering processes? Discuss, in brief, the physical weathering processes. 7

(c) Give two examples of each type of major rocks. Discuss, in brief, sedimentary and metamorphic rocks. 8

2. (a) What is diastraphism? Draw neat sketch of a typical fold geometry showing its major features. 5

(b) Write short notes on faults, joints and rock cleavage. 6

(c) What is mineral? Classify mineral (no description required). Discuss, in brief non-silicate mineral. Distinguish between Ferromagnesian and Non-Ferromagnesian Silicates. 9

3. (a) Classify (mention names only) faults and draw sketch of any one type of fault. 4

(b) Mention the aftermaths of liquefaction phenomenon. 4

(c) Classify and discuss briefly (no sketch required) different types of waves generated due to earthquake. 8

(d) Classify and discuss briefly (with neat sketches) two types of folds. 4

4. Briefly discuss, mention or draw sketches, as asked for, on **any four** of the following topics:- **5 X 4 = 20**

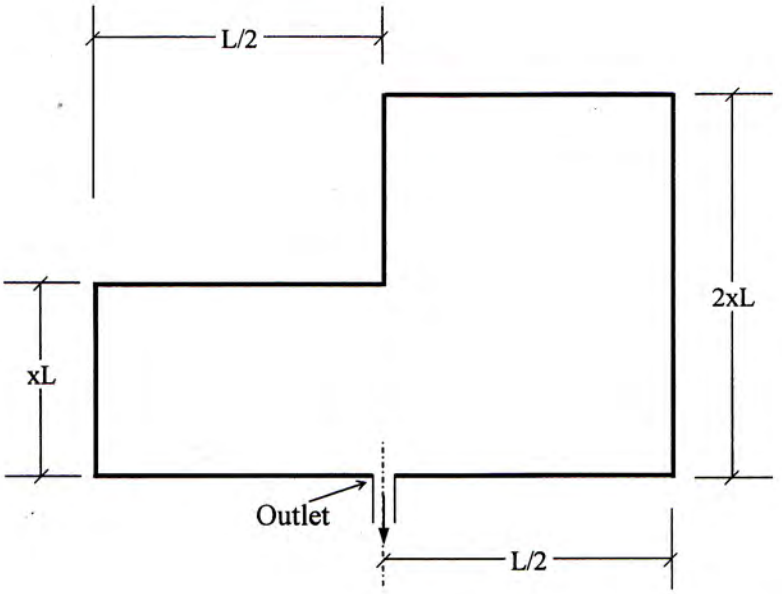
(i) Schematic diagram of rock cycle
(ii) Principal zones of earth (names only) with a schematic diagram showing the thicknesses of different pats of lithosphere/geosphere.
(iii) Neat sketches of Oblique fault and Graben
(iv) Basic mechanism of liquefaction
(v) Major earthquake parameters (geometric) with neat sketches

PART B

There are **four (4)** questions in this section, answer **any three (3)**

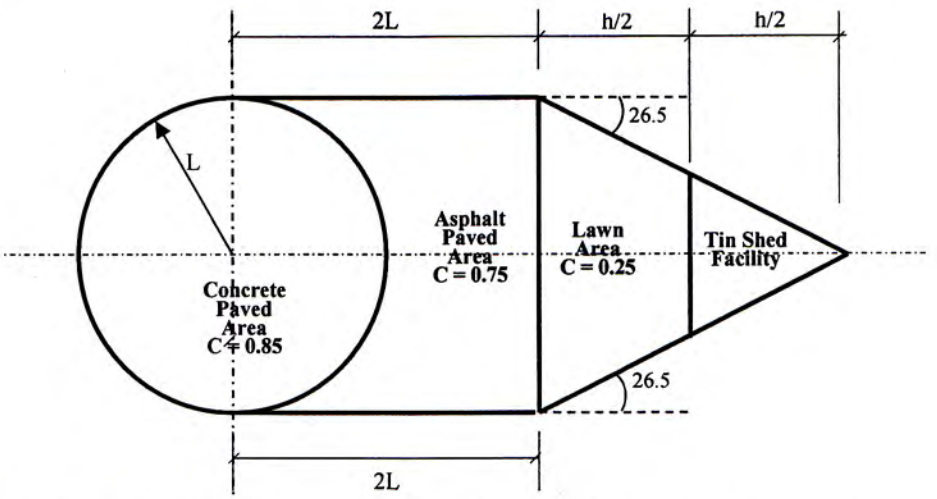
5. (a) Distinguish between infiltration and percolation. 3

(b) In the basin shown in the next page, x is a constant factor. For what value of x, the peak flow rate or runoff (Q_p) will be the maximum for the basin? Find the FF and CC of the basin for maximum runoff. Also find the axial length (L_A) of the following drainage basin for maximum runoff if L = 2.5 miles. 8



(c) Using the information provided below, calculate d for the catchment area as shown below. 9

Intensity of Rainfall: **2.25 inch/hour** **Assume L & h in yard**
Q_p: **0.712 m^3/s**



6. (a) What are the major causes of river erosion? Mention three hydraulic actions responsible for river erosion. 3

(b) Discuss, in brief, about saltation. 3

(c) Prove that $\tau = \gamma_\omega R_H s$; where symbols carry their usual meanings. 5

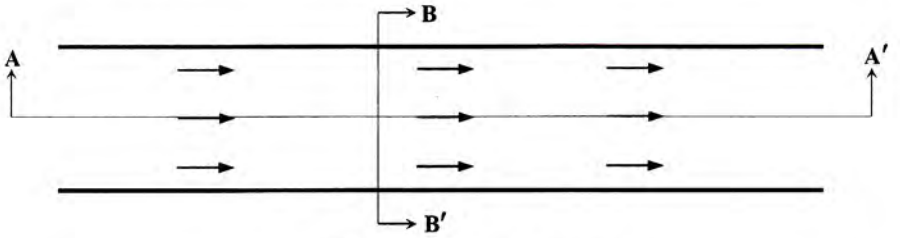
(d) Prove the following: 3

For a rectangular channel having D >>>> B, $\tau \propto B$

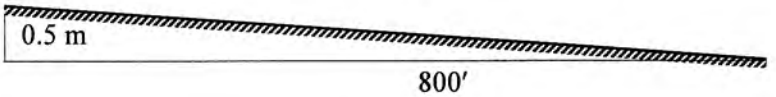
where

τ = unit tractive force along the channel bottom
D = depth of channel
B = bottom width of rectangular channel

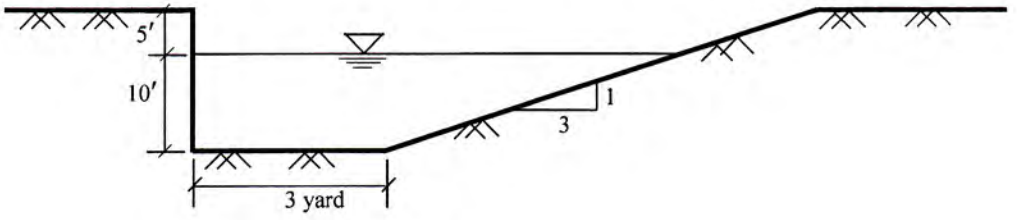
(e) The longitudinal and cross-sectional profiles of a channel are shown. Calculate the unit tractive force along the channel bottom. 6



Plan of a Channel Course



Section **A-A′**
(Longitudinal Profile)



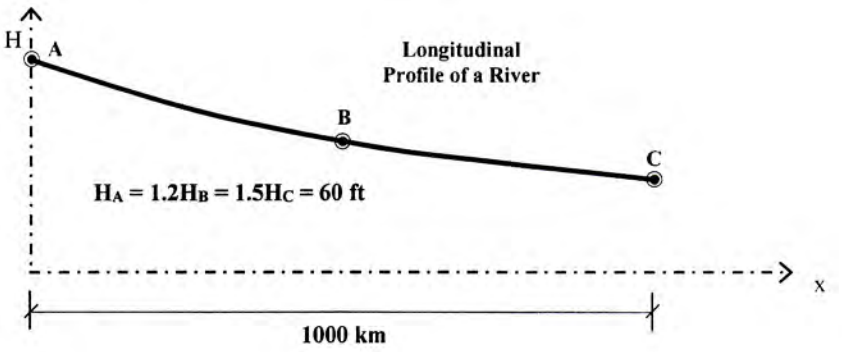
Section **B-B′**
(Cross-Sectional Profile)

7. (a) Prove that $d \propto v^2$; where symbols carry their usual meanings. 8

(b) Maximum size of sediment transported by one river (R-1) is sixteen times than that of another river (R-2). Derive a correlation between the velocities of two rivers. 3

(c) Prove that $H = a\, e^{-bx}$; where symbols carry their usual meanings. 5

(d) From the figure shown below, calculate the horizontal distance between locations B and C. 4



8. (a) Mention the factors affecting drainage pattern. Classify and discuss, in brief with sketches, any two types of drainage patterns. 8

(b) Sketch a typical cross-section of a river/stream valley. Classify (mention names only) valley according to the stage, genesis and controlling structures. 3

(c) Discuss, in brief, the ways valleys are deepened and widened. 9