2-2

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2019
Program: B.Sc. Engineering (Civil)

Course Title: Numerical Analysis and Computer Programming — Course Code: CE 205

Time- 1 hour — Full marks: 60

Answer the following questions

1. **a)** Determine a positive root of $xe^x = 2$ by the method of Regula Falsi method. Perform up to five iterations. 7

   b) Determine the approximate value for the real root of $x\,log_{10}x - 1.2 = 0$ using Newton Raphson method. Correct up to three decimal places. 7

2. Using the method of least squares, fit a curve of the form $y = \frac{x}{a+bx}$ to the following data: 8

   $(3, 7.148), (5, 10.231), (8, 13.509), (12, 16.434)$

3. **a)** Derive Newton- Raphson method. What is the limitation of N-R method? How can you overcome this limitation? Also name the method. (2+1+2+1)

   b) Define the following two: (6+6)

   i. Fixed point

   ii. Transcendental Equation

4. Write a program that can read two numbers, a & b, in a way that user inserts the smaller number first and then lists the numbers which are divisible by 11 between a & b. 12

5. **a)** Rewrite the following program using correct syntax. 8

```
#include<iostreem>
#include<math.h>
using namespce std;

float cylinder (int radius; int height) {     return (3.1416* pow(radius,2) *height);     }

float sphere (int radius)                {     return (4*3.1416* pow(radius,3) /3)         }

float cone (int radius, int height)     {     return (3.1416* pow(radius,2) *height/3);

int main ()
{
        cout<<2*sphere(3)+cylinder(3,8)< endl;
        return 0;
}
```

   b) Write the output of the program written in **5.a**. 2

6. **a)** What are the conditions for choosing a correct identifier? 3

   b) Write a program using *switch statement* 5

University of Asia Pacific
Department of Civil Engineering
Mid-Semester Examination Fall-2019
Program: B.Sc. Engineering

Course Title: Principles of Economics Course Code: ECN (CE) 201 Credit: 2.00
Time: 1.00 Hour Full Mark: 60

Questions

Answer any three questions including Q-1 and Q-2.

1.	**a.**	What are the key concepts in economics? Discuss 'Decisions Made at the Margin'.	12
	b.	Explain Efficiency. Provide a graphical representation of Efficiency.	8
2.		How the Market Supply Schedule and Market Supply Curve are derived? Prepare Supply Schedule and corresponding Supply Curves.	20
3.	**a.**	Discuss Ceteris Paribus. Explain its relevance in analyzing economic trends and facts.	10
	b.	Define Demand. Explain Law of Demand.	10

OR

4.		What are the ways of representing the Law of Demand?	20

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Fall 2019

Course # : CE-203 Course Title: Engineering Geology & Geomorphology
Full Marks: 50 Time: 1 hour

Answer to all the questions

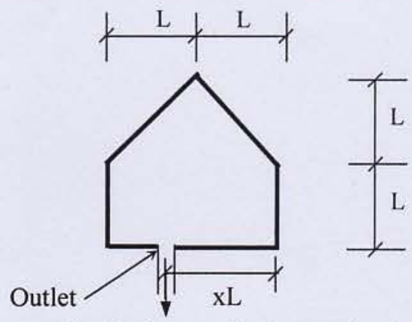
1a) Draw a schematic diagram showing thicknesses of geosphere/lithosphere. **3.5**

1b) Provide two examples of each type of rocks. **1.5**

1c) Classify (mention names only) physical and chemical weathering processes. Distinguish (at least two) between these processes. **3+2**

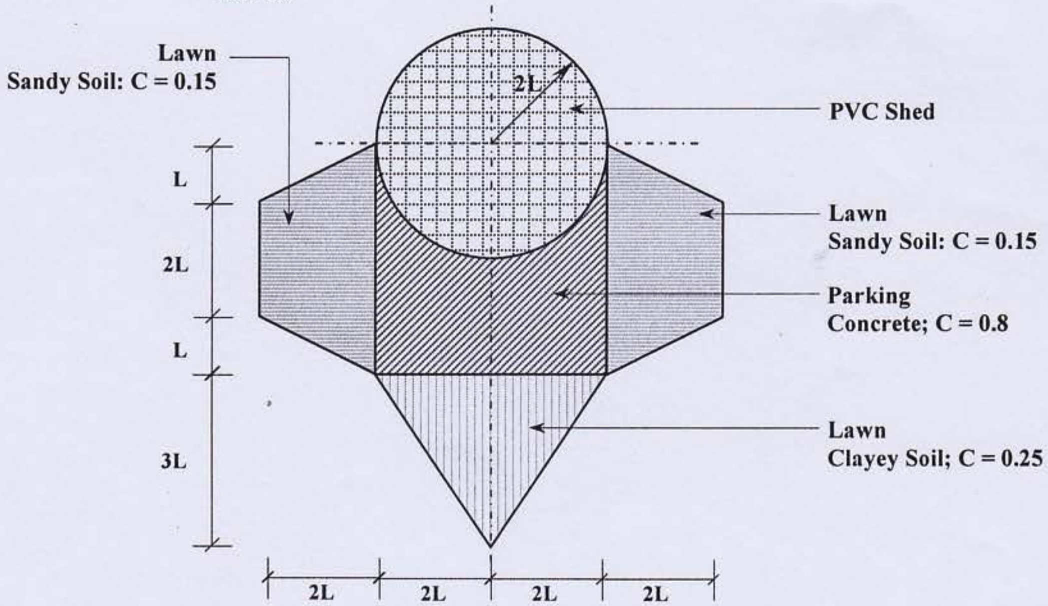
2a) Show the ways (dependency only; no description required), runoff is affected by the basin characteristics. **3**

2b) For the following basin, x is a constant factor. Analyze for three basins where values of x are 0.5, 1 and 2, respectively and identify the one that would exhibit maximum runoff. Justify your answer. Also calculate the FF and CC of the basin. **12**



2c) Using the information provided below, calculate L for the catchment area as shown below. **13**

Intensity of Rainfall: **1.0 inch/hour**
Q_p: **20 m^3/s**



3a) What is Fold, Joint and Rock Cleavage? **8**

3b) Draw neat sketches of Reverse Fault and Horst. **4**

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2019
Program: B.Sc. Engineering (Civil)

Course Title: Fluid Mechanics　　　　　　　　　　Course Code: CE 221
Time- 1 hour　　　　　　　　　　　　　　　　　　Full marks: 40

Answer the following questions. (All the questions have to be answered)
Assume reasonable number for the missing values

1. (a) Mention and describe shortly the branches of fluid mechanics. [2]
   (b) With a net sketch show the Absolute, Atmospheric and Gauge Pressure. [3]
   (c) Discuss general types of fluid flow with their mathematical expression. [3]
   (d) Define the (i) Path line; (ii) Stream line; (iii) Streak line; and (iv) Stream tube. [4]
   (e) Define (i) Center of Pressure ; (ii) Hydrostatic Pressure Force. [3]

2. (a) A manometer is used to measure the pressure (P1) of a gas in a tank, as shown in the Figure 2(a) below. The atmospheric pressure is 765 mm Hg. Assume the density of water is 1000 kg/m^3. [SG of Fluid A=2.6; SG of Fluid B=4.5]
   (i) Convert the atmospheric pressure to KPa;
   (ii)Calculate the absolute pressure in the tank;
   (iii)Calculate the gage pressure in the tank. [8]

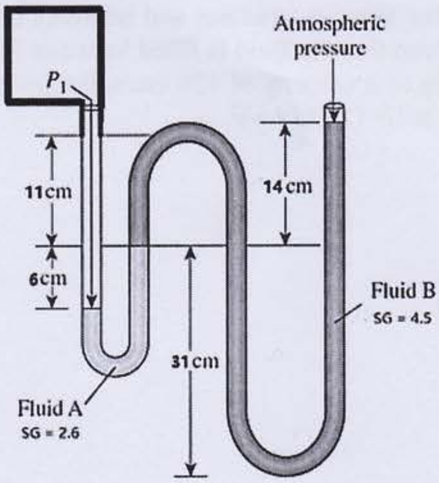


Figure: 2(a)

(b) A gate having the cross section shown in Figure 2(b) closes an opening 5 ft wide and 4 ft high in a water reservoir. The gate weighs 500 lb, and its center of gravity is 1 ft to the left of AC and 2 ft above BC. Determine the horizontal reaction that is developed on the gate at C. [9]

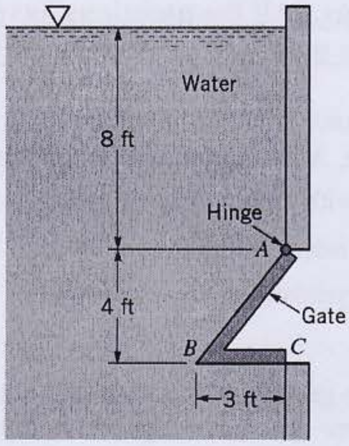


Figure: 2(b)

(c) The density and kinematic viscosity of a fluid at 20˚C are 1.32 gm/cm^3 and 18 stokes, respectively, Calculate the velocity gradient and intensity of shear stress at a distance 4 cm from the lower plate. Given that the fluid is filled between two parallel plates 8 cm apart and the upper plate is moving at a velocity of 120 cm/s, the lower one being stationary. Assume the velocity distribution is $U=120-k(8-y)^2$. [8]

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2019 (Set 1)

Course #: CE 213 Course Title: Mechanics of Solids II
Full Marks: 40 (= 4 × 10) Time: 1 hour

(Points on the right within parentheses indicate full marks)

1. Fig. 1 shows an open cross-section (wall thickness = 0.10″) subjected to horizontal shear forces X_1 [= (100 + Roll No.) kips] and X_2 (= $0.5X_1$).

   Calculate the maximum shear stress on the section, including Flexural Shear and Torsional Shear. (2+4+4)

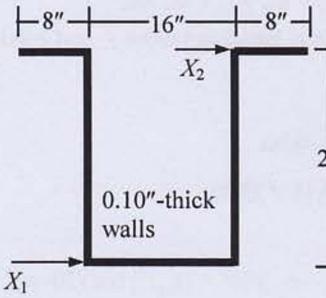


Fig. 1

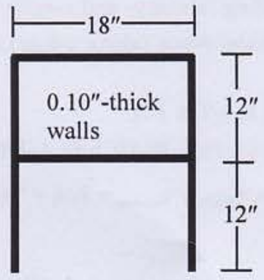


Fig. 2

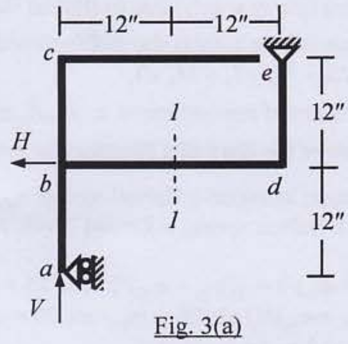


Fig. 3(a)

Fig. 3(b)

2. For the cross-section shown in Fig. 2 (with wall thickness = 0.10″)
   (i) Determine the equations for the Kern (8)
   (ii) Show the Kern zone on the section. (2)

3. Fig. 3(a) shows a 2-diemensional frame *abcde* with 1″-dia circular cross-section [shown in Fig. 3(b)] subjected to forces H and V [both = (100 + Roll No.) kips].

   At the centroid (o) of section *1-1* of the frame
   (i) Calculate the maximum normal stress and shear stress (6)
   (ii) Draw the Mohr's circle of stresses, also showing the principal planes. (4)

4. Calculate the equivalent polar moment of inertia (J_{eq}) for the cross-section shown in Fig. 4 by centerline dimensions [Given: Wall thickness = 0.10′ throughout]. (10)

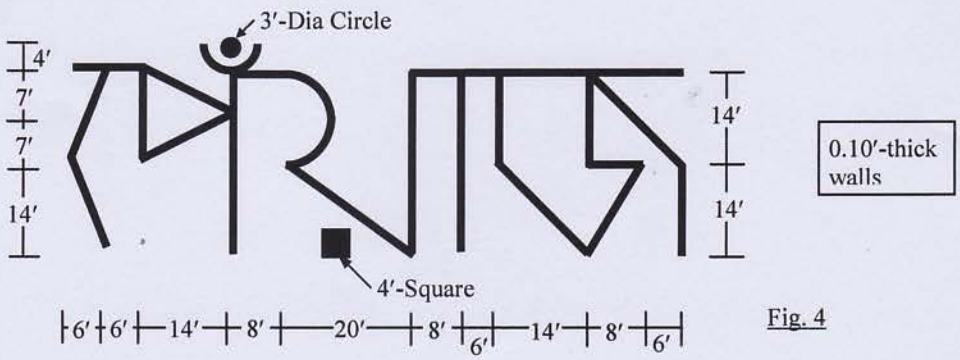


Fig. 4

List of Useful Formulae for CE 213

* Torsional Rotation $\phi_B - \phi_A = \int(T/J_{eq}G)\,dx$, and $= (TL/J_{eq}G\text{-})$, if T, J_{eq} and G are constants

Section	Torsional Shear Stress	J_{eq}
Solid Circular	$\tau = Tc/J$	$\pi d^4/32$
Thin-walled	$\tau = T/(2\textcircled{A}\,t)$	$4\textcircled{A}^2/(\int ds/t)$
Rectangular	$\tau = T/(\alpha b t^2)$	$\beta b t^3$

b/t	1.0	1.5	2.0	3.0	6.0	10.0	∞
α	0.208	0.231	0.246	0.267	0.299	0.312	0.333
β	0.141	0.196	0.229	0.263	0.299	0.312	0.333

* For compound section, $T_1/J_1G_1 = T_2/J_2G_2 = T_3/J_3G_3 = \ldots\ldots$

* Normal Stress (along x-axis) due to Biaxial Bending (about y- and z-axis): $\sigma_x(y, z) = M_z\, y/I_z + M_y\, z/I_y$

* Normal Stress (along x-axis) due to Combined Axial Force (along x-axis) and Biaxial Bending (about y- and z-axis): $\sigma_x(y, z) = P/A + M_z\, y/I_z + M_y\, z/I_y$

* Equation of Kern of any section: $\pm\, e_y\, y_{max}/I_z \pm e_z\, z_{max}/I_y \leq 1/A$

* Corner points of the Kern of a Rectangular Area are $(b/6, 0)$, $(0, h/6)$, $(-b/6, 0)$, $(0, -h/6)$

* Maximum shear stress on a Helical spring: $\tau_{max} = \tau_{direct} + \tau_{torsion} = P/A + Tr/J = P/A\,(1 + 2R/r)$
* Stiffness of a Helical spring is $k = Gd^4/(64R^3N)$

* $\sigma_{xx}' = (\sigma_{xx} + \sigma_{yy})/2 + \{(\sigma_{xx} - \sigma_{yy})/2\} \cos 2\theta + (\tau_{xy}) \sin 2\theta = (\sigma_{xx} + \sigma_{yy})/2 + \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]} \cos (2\theta-\alpha)$
  $\tau_{xy}' = -\{(\sigma_{xx} - \sigma_{yy})/2\} \sin 2\theta + (\tau_{xy}) \cos 2\theta = \tau_{xy}' = -\sqrt{[\{(-\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]} \sin (2\theta-\alpha)$
  where $\tan \alpha = 2\,\tau_{xy}/(\sigma_{xx} - \sigma_{yy})$
* $\sigma_{xx(max)} = (\sigma_{xx} + \sigma_{yy})/2 + \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2,\ \alpha/2 + 180°$
  $\sigma_{xx(min)} = (\sigma_{xx} + \sigma_{yy})/2 - \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2 \pm 90°$
* $\tau_{xy(max)} = \sqrt{[\{(\sigma_{xx}-\sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2 - 45°,\ \alpha/2 + 135°$
  $\tau_{xy(min)} = -\sqrt{[\{(\sigma_{xx}-\sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2 + 45°,\ \alpha/2 - 135°$

* Mohr's Circle of Stresses: Center $(a, 0) = [(\sigma_{xx} + \sigma_{yy})/2, 0]$ and radius $R = \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$

* To avoid yielding
  Maximum Normal Stress Theory (Rankine): $|\sigma_1| \leq Y$, or $|\sigma_2| \leq Y$.
  Maximum Normal Strain Theory (St. Venant): $|\sigma_1 - \nu\sigma_2| \leq Y$, or $|\sigma_2 - \nu\sigma_1| \leq Y$.
  Maximum Shear Stress Theory (Tresca): $|\sigma_1 - \sigma_2| \leq Y$, $|\sigma_1| \leq Y$, or $|\sigma_2| \leq Y$
  Maximum Distortion-Energy Theory (Von Mises): $\sigma_1^2 + \sigma_2^2 - \sigma_1\sigma_2 \leq Y^2$

University of Asia Pacific
Department of Basic Sciences & Humanities
Mid Examination, Fall-2019
Program: B.Sc. in Civil Engineering

Course Title: Mathematics IV | Course Code: MTH 203 | Credit: 3.00
Time: 1.00 Hour | Full Marks: 60

There are **Four** Questions. **Answer three questions including Questions 1 and 4.** All questions are of equal value. Figures in the right margin indicate marks.

1. (a) Define differential equation. Find the ordinary differential equation by eliminating the constants a and b from $y = e^x(a\cos x + b\sin x)$. Also write down the order and degree of this differential equation. **10**

(b) An circuit has an emf of 5 $Volt$, resistance of 50 Ω, inductance of 1 $Henry$ and no initial current. Find current at any time t. **10**

2. (a) Check whether the equation $(2xy + 1)dx + (x^2 + 4y)dy = 0$ is exact. If exact then solve this differential equation. **8**

(b) Solve the following differential equations using appropriate methods: **12**

(i) $x^2\frac{dy}{dx} - 2xy = 3y^4$

(ii) $\frac{dy}{dx} = 1 + e^{y-x+5}$

OR

3. (a) Check whether the equation $(x^2 - 4xy - 2y^2)dx + (y^2 - 4xy - 2x^2)dy = 0$ is exact. If exact then solve this differential equation. **8**

(b) Solve the following differential equations using appropriate methods: **12**

(i) $x^4\frac{dy}{dx} + 2x^3y = 1$

(ii) $\frac{dy}{dx} = (x + y + 1)^2$

4. Solve the following higher order differential equations using appropriate methods: **20**

(i) $\frac{d^3y}{dx^3} - 4\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 18y = 0$

(ii) $(D^2 - 3D + 2)y = e^x$

(iii) $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 25y = 0$

(iv) $(D^2 - 2D + 1)y = \cos 3x$