2-2

# University of Asia Pacific
## Department of Civil Engineering
## Mid-Term Examination, Spring 2019
## Program: B. Sc Engineering (2nd Year 2nd Semester)

Course Title: Principle of Economics | Course Code: ECN (CE) 201 | Credit: 2.00

Time: 1.00 Hour. | Full Marks: 20

**Answer any two of the following questions.**

**1.** **a.** What is supply? Describe the law of supply. (10)

**b.** Supply and demand for T- Shirts are shown in the table below. Draw the graph of demand and supply curves and identify the equilibrium.

| Price (Tk.) | Quantity Demanded | Quantity Supplied |
|---|---|---|
| 200 | 20 | 70 |
| 175 | 30 | 55 |
| 150 | 40 | 40 |
| 125 | 50 | 25 |
| 100 | 60 | 10 |

**2.** **a.** What is total utility? Explain the law of diminishing marginal utility with example and graph. (10)

**b.** Write short notes (any five):

a) Inferior goods
b) Government policies – tax & subsidies
c) Unit elastic supply
d) Budget allocation in elasticity
e) Substitute goods
f) Opportunity cost

**3** **a.** What is elasticity of demand? Describe different types of elasticity of demand. (10)

**b.** The accompanying table gives part of the demand schedule for mobile phone

| **Price (Taka)** | **Quantity demanded** |
|---|---|
| 15,000 | 12,000 |
| 20,000 | 8,000 |

i) Calculate the price elasticity of demand when the price increases from tk.15,000 to tk.20,000.

ii) Suppose, firms produce 2,000 more mobile at any given price due to improved technology. As price decreases from tk.20,000 to tk.15,000, is the price elasticity of demand now greater than, less than, or the same as it was in part i ?

# University of Asia Pacific
## Department of Basic Sciences & Humanities
## Mid Examination, Spring -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 any **Three**. All questions are of equal value. Figures in the right margin indicate marks.

**1.** (a) A fossilized bone is found to contain one-thousandth the original amount of C-14. The rate of decay is proportional to the amount of C-14 at present. Determine the age of the fossil. The half-life of radioactive C-14 is 5600 years. **10**

(b) Solve: $P^2 + 2Pycotx - y^2 = 0$ , where $P = \frac{dy}{dx}$ **10**

**2.** (a) Define Bernoulli's equation and solve $\frac{dy}{dx} + xsin2y = x^3cos^2y$ **10**

(b) Solve: **10**

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

(ii) $(D^2 - 9)y = e^{3x}cosx$

**3.** Solve the following differential equations using appropriate methods: **20**

(i) $\left(1 + e^{\frac{x}{y}}\right)dx + e^{\frac{x}{y}}\left(1 - \frac{x}{y}\right)dy = 0$

(ii) $\sqrt{a + x}\,\frac{dy}{dx} + x = 0$

(iii) $\frac{dy}{dx} = \frac{x+3y}{3x+y}$

**4.** (a) Find the differential equation of $xy = ae^x + be^{-x} + x^2$ , where $a$ and b are constants. Also write down the order and degree of this differential equation. **10**

(b) Solve: **6+4**

(i) $(D^4 - 2D^3 + 5D^2)y = 0$

(ii) $(D^2 + 4D + 4)y = 0$

# University of Asia Pacific
# Department of Civil Engineering
# Midterm Examination Spring 2019

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

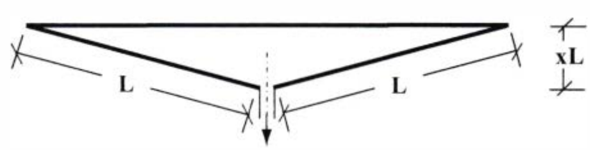
Answer to all the questions

**1a)** What is metamorphism? Show three examples of metamorphic rocks that are generated from sedimentary rocks due to metamorphism. 2+3

**1b)** Distinguish (at least two) between sediments and sedimentary rocks. 3

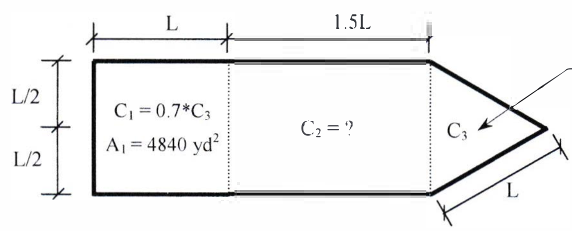
**1c)** Distinguish (at least two) between weathering and erosion. Define physical and chemical weathering processes. 3+4

**2a)** In the following basin, for what value of x, the flow rate (Q) or runoff will be the maximum? 10




**2b)** Write down three assumptions of Rational Formula. 3

**2c)** For the drainage area as shown below, calculate co-efficient of runoff ($C_2$) for $Q_p$ = 0.361 $ft^3/s$ and I =0.25 inch/hour. 12




**3b)** What is diastraphism? 2

**3b)** Classify folds (mention names only). 2

**3c)** Draw neat sketches of onlique fault and graben. 6

# University of Asia Pacific
## Department of Civil Engineering
## Mid Semester Examination Spring 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.**
```
#include<iostram>
using namespace std;
int Main()
{
        Float CE205A [10][5]:
        int i, j;
        for(i=0: i<10; i++); { CE205A [i][0]= 205001+i; }

        cout<"Enter quiz marks serially";

        cout<<"\nQuiz1\n';
        for(i=0; i<10; i++) { cin>CE205A[i][1]; }

        cout<<"\nQuiz2\n";
        for(i=0; i<10; i++) {  cin>>CE205A[i][2];}

        cout<<"\nQuiz3\n";
        for(i=0; i<10; i++) { cin>>CE205A[i][3]; }

        for(i=0; i<10; i++)
        {
                for(j=0; j<5; j++)
                {
                        cout<<CE205A[i][j];
                        cout<<"\t";

                cout<<"\n";
        }
        return o
}
```

***Table 1***: CE205A

| Reg. No | Quiz 1 | Quiz 2 | Quiz 3 | Average |
|---|---|---|---|---|
| 205001 | | | | |
| 205002 | | | | |
| 205003 | | | | |
| 205004 | | | | |
| 205005 | | | | |
| 205006 | | | | |
| 205007 | | | | |
| 205008 | | | | |
| 205009 | | | | |
| 205010 | | | | |

**a)** The above program stores 3 Quiz marks of 10 students of CE 205 A as shown in ***Table 1***. Rewrite the program using correct syntax. (09)

**b)** What additional lines should be added to the stated program to store Average Quiz marks in the last column (***Table 1***)? (05)

**2.** Write a program using Jump structures. (06)

**OR**

Write a program using *do…while loop*.

3. Write a program that can calculate the sum of following series up to $n^{th}$ term. (10)

$$1+ 4*2 + 7*2^2 + 10*2^3 + \ldots\ldots\ldots\ldots + \{1+(n-1)*3\}2^{n-1}$$

4. Determine the root of the equation $\boldsymbol{x^2 + sin(x) - 2 = 0}$ between the interval **[1, 2]** by the Secant method. Use the accuracy of 0.001. (08)

5. Determine the root of the equation $\boldsymbol{f(x) = cos(x) + e^x - 2x^2}$ by Newton Raphson method. Use the accuracy of 0.0001. (10)

6. Solve the following system using Jacobi method. (12)

$$\begin{array}{llll} 10x & +4y & +2z & = 1 \\ 4x & +9y & -2z & = 3 \\ 2x & +4y & +10z & = -3 \end{array}$$

# University of Asia Pacific
# Department of Civil Engineering
# Mid Semester Examination Spring 2019 (Set 2)

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 section (wall thickness 0.10″) subjected to eccentric shear forces $F_1$ [= (100 + Roll No.) kips] and $F_2$ (= $0.5F_1$). (4+4+2)

   Calculate the compound shear stress on the section, including Flexural Shear and Torsional Shear.

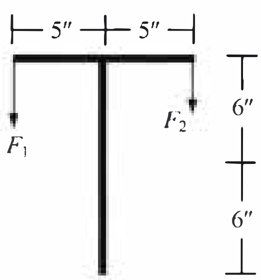



Fig. 1

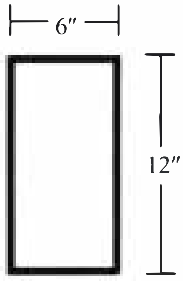



Fig. 2

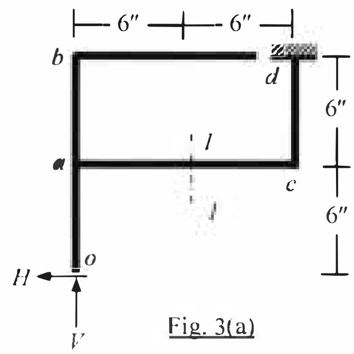



Fig. 3(a)

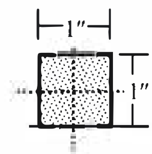



Fig. 3(b)

2. Determine the Kern of the cross-section shown in Fig. 2 (with wall thickness 0.10″) and also show the Kern on the section. (10)

3. Fig. 3(a) shows a frame *oabcd* [with (1″ × 1″) cross-section shown in Fig. 3(b)] subjected to horizontal force $H$ and vertical force $V$, with $H = V =$ (100 + Roll No.) kips.

   (i) Calculate the maximum normal stress and shear stress at the centroid of section *1-1*. (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)

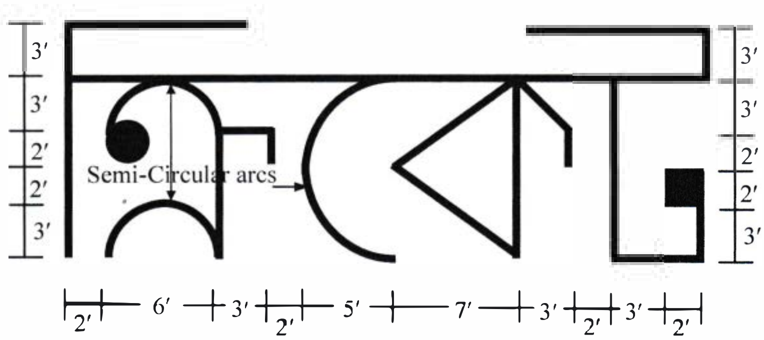



Fig. 4

# List of Useful Formulae for CE 213

* Torsional Rotation $\phi_B - \phi_A = \int(T/J_{eq}G)\,dx$, and $= (TL/J_{eq}G)$, 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 | $\tau = T/(2A\,t)$ | $4A^2/(\int ds/t)$ |
| Rectangular | $\tau = T/(\alpha bt^2)$ | $\beta bt^3$ |

| b/t | 1.0 | 1.5 | 2.0 | 3.0 | 6.0 | 10.0 | $\infty$ |
|---|---|---|---|---|---|---|---|
| $\alpha$ | 0.208 | 0.231 | 0.246 | 0.267 | 0.299 | 0.312 | 0.333 |
| $\beta$ | 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 Civil Engineering
# Mid Semester Examination Spring 2019
# Program: B.Sc. Engineering (Civil)

Course Title: Fluid Mechanics — Course Code: CE 221

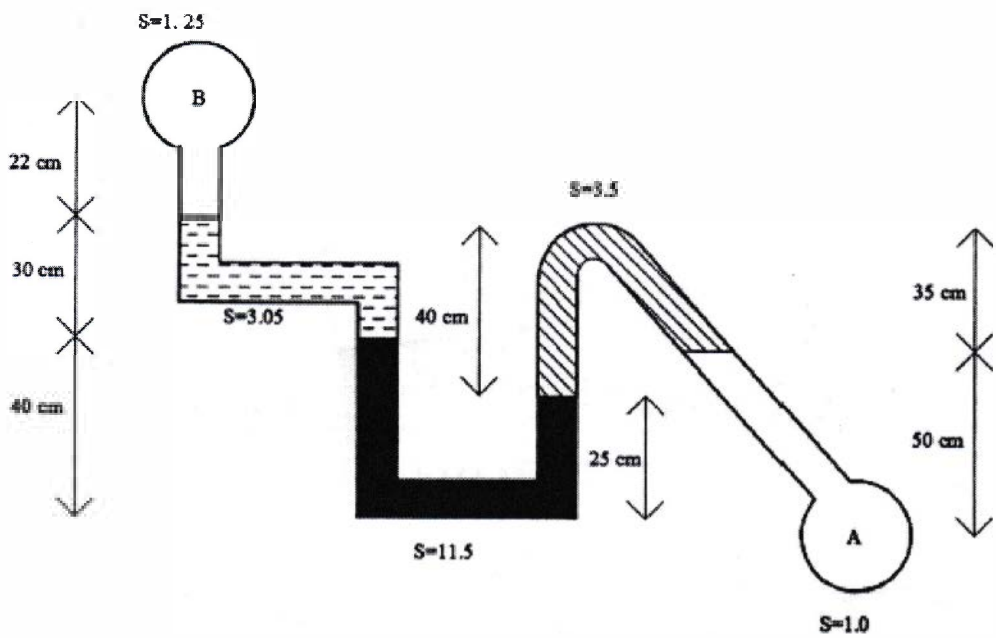
Time- 1 hour — Full marks: 30 (3*10=30)

**Answer any 3 (three) among the 4 (four) questions.**
**Assume reasonable number for the missing values**

1. (a) Differentiate between the following terms: [4]
   (i) Piezometer and Manometer
   (ii) Cohesion and Adhesion

   (b) 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 $U=120-k(8-y)^2$. [6]

2. (a) Find the pressure difference between point A and point B. [7.5]




[Figure 1]

   (b) Which one is the most elementary device for measuring the pressure? Discuss the reasons behind its limited use. [2.5]

3. (a) Discuss general types of fluid flow with their characteristics and mathematical expression. [3]

(b) The velocity field of a flow is defined as $V = 2tx\hat{i} - t^2 y\hat{j} - 3xy\hat{k}$. [7]

(i) Is the flow steady or unsteady?

(ii) Can you approximate the flow as a 2-dimensional flow?

(iii) Determine the acceleration field.

4. (a) Define the (i) path line; (ii) Stream line; (iii) streak line; and (iv) stream tube [6]

(b) Convert a pressure head of 12 m of kerosene (density=800 kg/m$^3$) column to a carbon-tetra-chloride of specific gravity of 1.62. [4]