2-2

University of Asia Pacific
Department of Civil Engineering
Mid Examination Fall - 2018
Program: B.Sc in Civil Engineering

Course Title: Principles of Economics — Course Code: ECN 201
Time: 1 hour — Full Marks: 20

Answer all of the following questions

1 a. Explain why the demand curve for a good is downward sloping. (3)

b. A decrease in the price of liquid milk affects both the market for liquid milk and the market for condensed milk.

i. Is the change in the liquid milk market a change in quantity demanded or in demand? Explain. (1)

ii. Is the change in the condensed milk market a change in quantity demanded or in demand? Explain. (1)

2 a. Discuss the factors that cause a shift in the demand curve. (2.5)

b. Illustrate with diagram the effect of an increase in the demand for Mr. Shan Noodles on the equilibrium quantity and price (2.5)

3 From the data shown in the following table about supply of alarm clocks, calculate the price elasticity of supply from: point J to point K, point L to point M, and point N to point P. Classify the elasticity at each point as elastic, inelastic, or unit elastic. (5)

Point	Price	Quantity Supplied
J	$8	50
K	$9	70
L	$10	80
M	$11	88
N	$12	95
P	$13	100

4 The following data is about the production of pens per day by PnP Company.

Total number of pens	Fixed Costs	Variable Costs	Total Cost	Marginal Cost	Average Cost
0	60	0			
120	60	180			
280	60	360			
410	60	540			
520	60	720			
580	60	900			

Copy and complete the table. (5)

University of Asia Pacific
Department of Basic Sciences & Humanities
Mid Examination, Fall -2018
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 culture initially has P_0 number of bacteria. At $t = 2\ hour$, the number of bacteria is measured to be $\frac{5}{2}P_0$. If the rate of growth is proportional to the number of bacteria $P(t)$ present at time t, determine time necessary for the number of bacteria to triple. **10**

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

2. (a) Define Cauchy-Euler equation and solve $(3x^2D^2 + 2xD - 4)y = 0$ **10**

(b) Solve: **10**

(i) $(D^2 + D - 2)y = 2(1 + x - x^2)$

(ii) $(D^2 + 4)y = sin^2x$

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

(i) $(x - y^3 + y^2 sinx)dx - (3xy^2 + 2ycosx)dy = 0$

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

(iii) $\frac{y}{x}\cos\left(\frac{y}{x}\right)dx - \left\{\frac{x}{y}\sin\left(\frac{y}{x}\right) + \cos\left(\frac{y}{x}\right)\right\}dy = 0$

4. (a) Find the differential equation of $y = e^x(Acosx + Bsinx)$, where A and B are constants and also write down the order and degree of this differential equation. **10**

(b) Define Bernoulli's equation and solve $\frac{dy}{dx} = y(xy^3 - 1)$ **10**

University of Asia Pacific

Department of Civil Engineering

Midterm Examination Fall 2018

Course # : CE-203 | Course Title: Engineering Geology & Geomorphology

Full Marks: 45 (3 X 15 = 45) | Time: 1 hour

Answer all questions

1a) Draw a schematic diagram of the rock cycle and provide two examples of each type of rock. 5

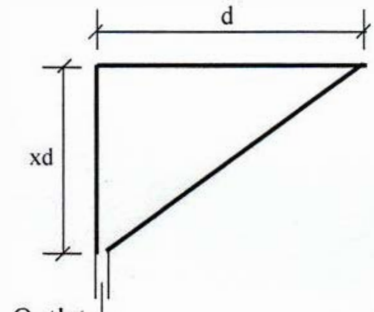
1b) Mention (names only) different geomorphic processes based on origin. 3

1c) Classify (mention names only) physical and chemical weathering processes. Discuss, in brief, any one of each process. 7

2a) With the aid of a sketch, show different components of total flow. 3

2b) Distinguish among precipitation, infiltration and percolation. 3

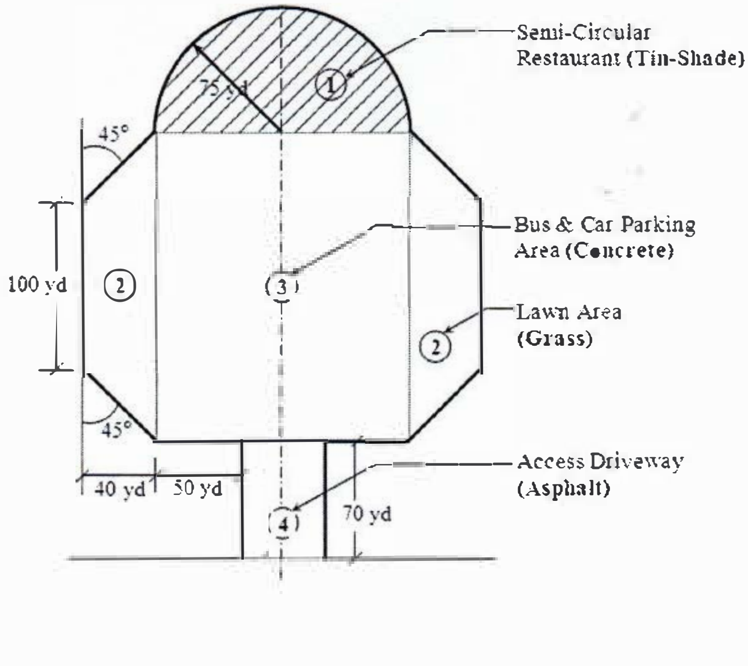
2c) In the following basin, for what value of x, the flow rate (Q) or runoff will be the maximum? Also find the FF and CC of the basin for maximum runoff. 9



3a) Mention the factors (no description required) affecting runoff. 3

3b) Write a short note on rational formula. 4

3c) Using the information provided, calculate the peak runoff (Q_P) in m^3/s for the following Highway Restaurant Area as bounded as shown below. Use rainfall intensity for the whole area to be 0.5 inch/hr and co-eff. of runoff for concrete, asphalt and grass as 0.8, 0.75 and 0.25, respectively. 8



University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2018
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. *Read the following program for 1(a),(b),(c)*

```
#include<iostream>
using namespace std

Float F (float  UnitWeight, int  height, float&  P)
/function to calculate soil pressure at the end of trapezoidal load
{
        float sum;
                        sum = 0.5* height  (2*P+height * UnitWeight);
                        return (sum)
}
int main ()
{
        float x1;
                        //x= pressure at the beginning of any layer of soil
        x1== 0;
                        //as pressure at the beginning of 1st layer is zero(shown in Figure 1)
        cout<<"soil pressure at the end of layer 1 ="<< F (80, 5, x1)<<endl;
        float x2= 80 * 5;
                        // pressure = height * unit weight
        cout<"soil pressure at the end of layer 2 ="<< F (100, 3, x2)<<endl;
        return 0;
}
```

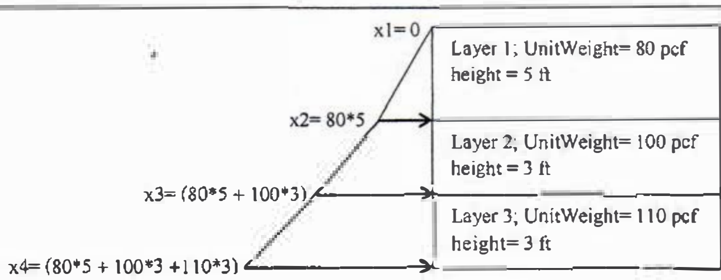


Figure 1

(a) Rewrite the program stated above using correct syntax. (04)

(b) How many types of data are used as variables in this program? Write two different types of data, with examples, that can be used as variables in C++. What are the conditions for validity of *Identifiers*. (04)

(c) What additional lines are to be written in the above program to display soil pressure at the end of layer 3, as shown in ***Figure 1***. Write the result of the program after this modification. (04)

(d) Write the result of ***1*** ***(one)*** of the following programs: (2)

```
#include<iostream>
using namespace std;
int main ()
{
        for(int n=10; n>0; n--)
        {
                cout<<n<<" ,";
        }
        cout <<" End!"<<endl;
        return 0;
}
```

```
#include<iostream>
using namespace std;
int main ()
{
        int n=10;
        do
        {
                cout<<n<<" ,";
                n++;
        }
        while (n<=20);
        cout<<"End!"<<endl;
        return 0;
}
```

(f) Write a program that can read obtained mark in an exam and evaluates the grade of the mark using Switch statement. (06)
[Total marks =100; grades: (0-49) = Fail; (50-100) = Pass]

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. (08)

(b) Determine the root of the equation $f(x) = \sin x + e^x - 4x^2$ by Newton Raphson method beginning with $x_0 = 1$. How accurate is the estimate after four iterations? (08)

(c) Derive the formula for Newton-Raphson method (04)

3. **(a)** Fit a function of the form $y = ae^{bx}$ to the following data (06)

x	1	2	3	4	5
y	1.6	4.5	13.8	40.2	125

(b) Determine the constants **a** and **b** for the least square straight line that fits the following data (04)

x	1	1.5	2	2.5	3
y	1.1	1.2	1.5	2.6	2.8

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2018 (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. Calculate the equivalent polar moment of inertia (J_{eq}) for the three cross-sections shown in Figs. 1(a)~(c) by centerline dimensions [Given: Wall thickness = 0.10′ throughout]. (4+3+3)

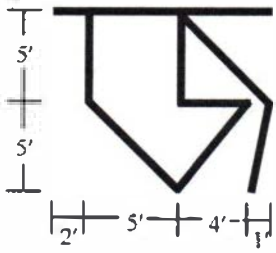


Fig. 1(a)

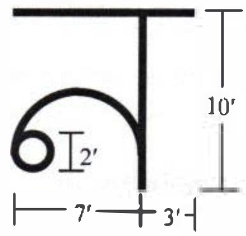


Fig. 1(b)

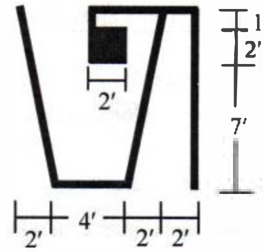


Fig. 1(c)

2. Fig. 2 shows a person (MR. PUBLIC) standing over the footing area (shaped AB) at points a_1 and b_1.

   If L = (200 + Roll/2) miles and MR. PUBLIC weighs P = 15 × 10^6 kips, calculate the

   (i) Axial stress on the footing area (3)

   (ii) Bending stress on the area at points a_1 and b_1. (6)

   (iii) Self-weight of the footing required to avoid overturning. (1)

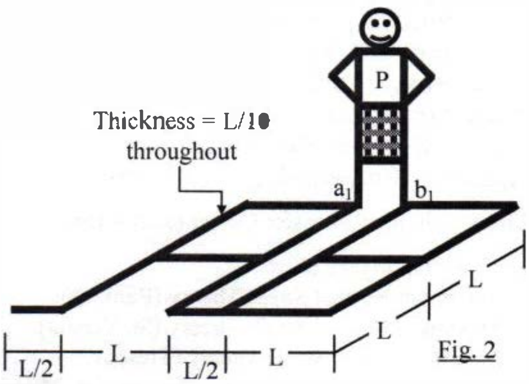


Fig. 2

3. Fig. 3 shows MR. PUBLIC, weighing P = 15 × 10^6 kips and holding weights (151w and 149w) in his two hands, while standing over a beam supported on helical springs S_1 and S_2.

   If L = (200 + Roll/2) mile and w = 5 × 10^4 kips, both springs deflect 1-in.

   (i) Calculate Spring S_2's Mean Radius (R_2), if it is 5 times its Coil Diameter (d_2); i.e. $R_2 = 5d_2$ (4)
   [Given: Shear modulus G = 12000 ksi, No. of coils = 5]

   (ii) Draw the Mohr's circle of stresses for Spring S_2. (6)

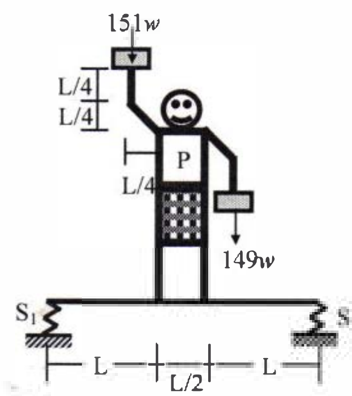


Fig. 3

4. If the public of Fig. 4 weighs p = 0.10 kip and is subjected to horizontal force $F_z = p/2$ (as shown), calculate the

   (i) Normal stress (σ_{yy}), Torsional Shear stress (τ_{xy}) and Principal stresses (σ_1, σ_2) at periphery of his right leg section (6)
   [Given: L_0 = (1 + Roll/100) ft, and
   His legs have 1″-dia circular sections].

   (ii) Yield Strength Y required to avoid yielding of the leg, according to Von Mises criteria. (4)

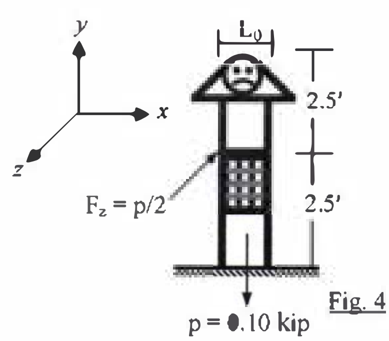


Fig. 4

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	$\tau = T/(\alpha b t^2)$	$\beta b t^3$

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

* 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): $\sigma_x(y, z) = P/A + M_z\, y/I_z + M_y\, z/I_y$
* 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 $R = \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$

* For Yielding to take place
  - Maximum Normal Stress Theory (Rankine): $|\sigma_1| \geq Y$, or $|\sigma_2| \geq Y$.
  - Maximum Normal Strain Theory (St. Venant): $|\sigma_1 - \nu\sigma_2| \geq Y$, or $|\sigma_2 - \nu\sigma_1| \geq Y$.
  - Maximum Shear Stress Theory (Tresca): $|\sigma_1 - \sigma_2| \geq Y$, $|\sigma_1| \geq Y$, or $|\sigma_2| \geq Y$
  - Maximum Distortion-Energy Theory (Von Mises): $\sigma_1^2 + \sigma_2^2 - \sigma_1\sigma_2 \geq Y^2$

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

Course Title: Fluid Mechanics — Course Code: CE 221

Full Marks: 60 — Time: 1 hour

[There are **four (04)** questions. Answer any **Three (03)** of those.]

1. (a) Explain the differences between piezometer and manometer.. [4]
   (b) Determine the height of a mercury column equivalent to a pressure of 18 kN/m^2. [4]
   (c) Prove mathematically that center of pressure and center of gravity is not same for a submerged plane surface. In which cases it becomes identical? [12]

2. (a) At a certain point in an oil the shear stress is 0.2 N/m^2 and the velocity gradient is 0.21 s^{-1}.If the mass density of the oil is 950 kg/ m^3 find the kinematic viscosity. [6]
   (b) The pressure at B in the following figure is 225 Kpa. Find out the absolute pressure at A. [14]

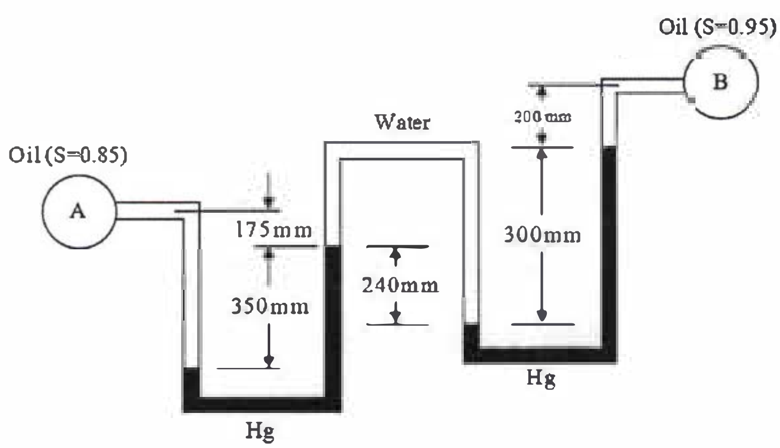


Figure 1

3. (a) Briefly explain the branches of fluid mechanics. [4]
   (b) A liquid has a mass density of 1550 kg/m^3. Calculate its specific weight, specific gravity and specific volume. [6]
   (c) Derive the formula for Newton's equation of viscosity with net sketch [10]

4. (a) A circular gate having 6m radius shown in Figure 2 is located in the inclined wall of a large reservoir containing a liquid having specific gravity 0.79 (Unit weight=0.79*10^3 N/m^3). The gate is mounted on a shaft along its horizontal diameter, and the liquid depth is 13 m above the shaft. Determine the magnitude and location of the resultant force exerted by the liquid on the gate. Also determine the moment that would have to be applied to the shaft to open the gate. Equation of center of gravity and moment of inertia in case of circular body is given in Table 1. [14]

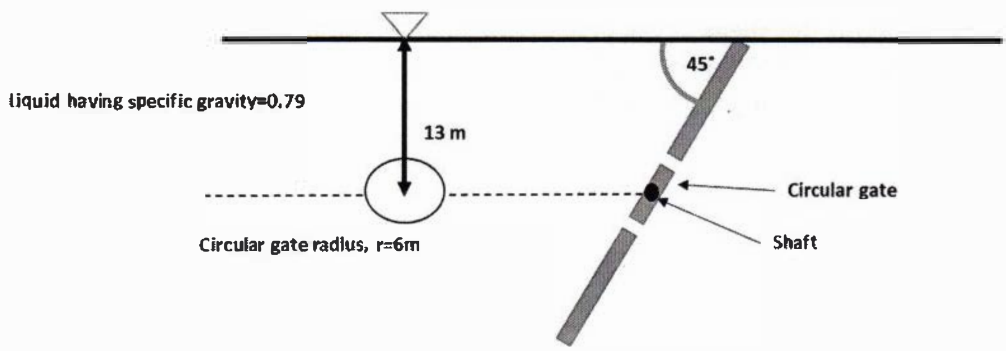
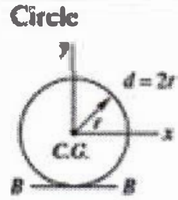


Figure 2

(b) Sketch examples of few situations where hydrostatic pressure forces may have to be calculated as water engineering work. [6]

Table :1

Shape	Area	Center of gravity	Moment of Inertia
Circle 	$\frac{1}{4}\pi d^2$	$\bar{x} = \frac{1}{2}d$ $\bar{y} = \frac{1}{2}d$	$I_0 = \frac{1}{64}\pi d^4$