University of Asia Pacific
Department of Basic Sciences and Humanities
Mid Semester Examination, Spring 2022
Program: B. Sc. Engineering (Civil)
2nd year 2nd semester

Course Title: Principles of Economics Course Code: ECN 201 Credit: 2.00

Total Time: 1 Hour Full Marks: 40

There are **Three** Questions. Answer **Two Questions including Q-1**.

1. **a.** $U = X_1 + X_2^2$. Price of X_1 is 2 tk, price of X_2 is 1 tk and income 100 tk. Find out the optimal value of X_1, X_2 and maximum utility. **8**

   b. Describe the Law of Diminishing Marginal Utility with an example. **6**

   c. Write down the properties of Indifference Curve. **6**

2. **a.** Describe different types of price elasticity of supply with the help of diagrams. **6**

   b. When demand is price elastic, a price decrease increases total revenue. - Explain **6**

   c. Calculate price elasticity and give interpretation: **8**

Q	P
10	5
15	10
25	12
30	15
40	20

OR

3. $P = 200 - 2Q$

   $P = 50 + Q$

   a. Calculate the equilibrium price and quantity. **6**

   b. Explain the impact of change in income on equilibrium price and quantity with the help of appropriate graph. **6**

   c. Find out the consumer surplus, producer surplus and total surplus from the given equations. **8**

University of Asia Pacific
Department of Basic Sciences & Humanities
Mid-Semester Examination, Spring 2022
Program: B.Sc. in Civil Engineering

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

There are **Four** questions. Answer any **Three**. All questions are of equal values, indicated in the right margin.

1. **(a)** Form the differential equation of the corresponding equation $c(y+c)^2 = x^3$ where, c is an arbitrary constant. **10**

(b) Eliminate the constants from $y = e^x(A\cos x + B\sin x)$ **10**

2. **(a)** Using separation of variables solve: $\frac{dy}{dx} = e^{x+y} + x^2 e^{x^3+y}$ **10**

(b) Solve the homogeneous differential equation: $(x^2+y^2)\,dx + 2xy\,dy = 0$ **10**

3. **(a)** Solve the exact differential Equation: $x\,dx + y\,dy + \frac{xdy-ydx}{x^2+y^2} = 0$ **10**

(b) Using Integrating factor, solve: $(1-x^2)\frac{dy}{dx} + 2xy = x\sqrt{1-x^2}$ **10**

4. Solve the non exact differential equations **20**

(i) $(x^2+y^2+1)dx - 2xy\,dy = 0$

(ii) $\left(y + \frac{1}{3}y^3 + \frac{1}{2}x^2\right)dx + \frac{1}{4}(x+xy^2)dy = 0$

University of Asia Pacific

Department of Civil Engineering
Midterm Examination Spring 2022

Course # : CE 203 — Course Title: Engineering Geology & Geomorphology

Full Marks: 40 — Time: 1 hour

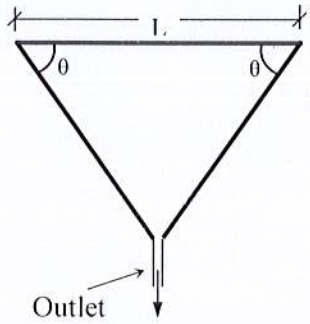
Answer to all the questions

1(a). Classify (no description required) principal zones of the earth from geologic point of view. Write down the thicknesses (no sketch required) of different parts of lithosphere. 2 +2=4

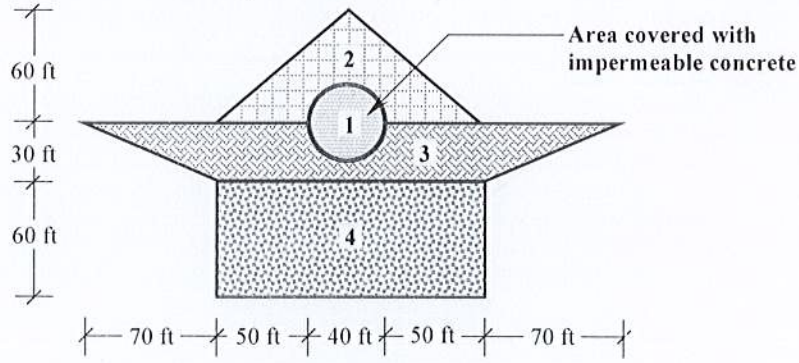
1(b). Give examples of sediments and at least two examples of each type of primary rocks. 2

1(c). Distinguish between physical and chemical weathering processes. Also distinguish between weathering and erosion. 3+3=6

2. For the following basin, find the value of θ that would create maximum runoff. Also calculate the FF and CC of the basin. 10



3. For the drainage area as shown below, calculate peak runoff in m^3/s. Use $C_2 = 0.8$, $C_3 = 0.5$ and $C_4 = 0.7$ and $I = (C_1 + C_2 + C_3 + C_4)/2$ cm/hour. 8



4(a). Distinguish among precipitation, infiltration and percolation. 3

4(b). With the aid of a neat sketch show different parts of a typical fold geometry. 3

4(c). Classify (no description required) fault and draw a neat sketch of any one of them. 4

University of Asia Pacific
Department of Civil Engineering
Midterm Examination, Spring 2022
Program: B.Sc. Engineering (Civil)

Course Title: Numerical Analysis and Computer Programming | Course Code: CE 205
Time: 1 hour | Credit Hour: 3.00 | Full Marks: 40

(Answer ALL the questions)

1. Apply secant method to find the root of the equation $\cos x = xe^x$, which is correct to 3 decimal places. Use initial approximation of [0,1]. **[8]**

2. Solve the following equations using Gauss Seidel method.

$$4x-y-z=3$$

$$-x+y+7z=-6$$

$$-2x+6y+z=-9$$

Continue iterations until two successive approximations are identical when rounded to three significant digits. **[8]**

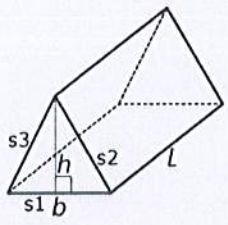
3. Following database is obtained for a runner participating in a marathon. Now, analyze the following data to determine a linear equation (y=mx+c) using least-square method. Also, calculate the goodness of the fit. **[5+3]**

Time (s)	0	30	60	90	120	150
Velocity (m/s)	0	0.3	0.5	0.95	1.5	1.9

4. The volume of a cylinder is expressed by the equation $V=\pi r^2 h$. Where V= 40m^3, h=3m. Solve the equation for radius 'r' using Newton-Raphson method, upto 1% tolerance level. **[6]**

5.

a)



The surface area of a triangular prism is given by

A= (s1+s2+s3)*L + bh

Now, use C++ coding language to write a program which will find the surface area of a triangular prism.

[4]

b)

Suppose, you are the owner of the construction company "Court of Owls". You want to track the weekly payable bill for your ongoing projects. You have total 4 ongoing projects. You hire construction laborers on weekly basis and distribute them to 4 projects. Each labor works at the rate of 130tk/hr. If the weekly payable bills of all the workers exceed 1,50,000 tk, then only 75% of the total payable amounts are given to the workers. The rest will be paid the next week. Now, create a code using C++ language that will show the total amount of bill payable by you on a certain week. Assume each labor works for 8hr/day and 5 days/week. **[6]**

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2022
Program: B. Sc. Engineering (Civil)

Course #: CE 213 — Course Title: Mechanics of Solids II

Full Marks: 40 (= 4 × 10) — Time: 1 hour

Given R_0 = Last two digits of Registration #

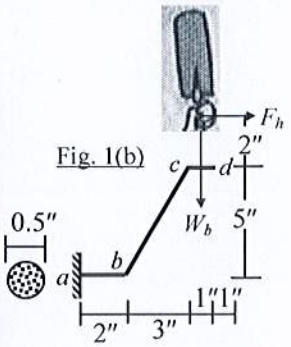
1. Fig. 1(a) shows a cat playing T20, while Fig. 1(b) shows an enlarged view of its hands holding a cricket bat.

   If $W_b = (2 + 0.01R_0)$ lb, $F_h = W_b/10$ and cross-section of the cat's bone is a 0.5″-diameter circle, calculate (at section *a* of its hand *abcd*) the

   (i) Maximum combined normal stress

   (ii) Principal stresses (σ_1, σ_2) and Directions (θ_1, θ_2) of principal planes } at the neutral axis


Fig. 1(a)



2. Fig. 2 shows enlarged view of the broken stump shown in Fig. 1(a), where the critical section is subjected to shear stress τ_{xy} (and $\sigma_{xx} = \sigma_{yy} = 0$). If material's yield strength is $Y = (30 + 0.2R_0)$ MPa,

   (a) Calculate the shear stress τ_{xy} required to cause yielding according to the criteria suggested by (i) Rankine, (ii) St. Venant [for Poisson's ratio = 0.3], (iii) Tresca, (iv) Von Mises

   (b) Draw the Mohr's Circle of stresses for the stress condition obtained for Von Mises.


Fig. 2

3. Fig. 3(a) shows a mouse kicking a cat.

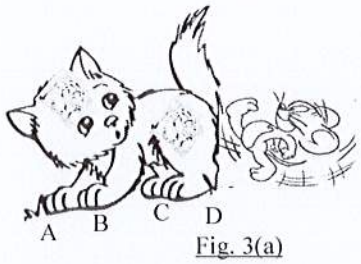


Fig. 3(a)

Fig. 3(b) and Fig. 3(c) show schematic diagrams of the cat, whose four legs (A, B, C, D) are shown as four columns supporting a rigid body (with center of gravity at G).

The cat weighs W_0 [= $(10 + 0.05R_0)$ lbs], while the mouse inserts on it a horizontal force P_0 (= $0.2W_0$) and an overturning moment $M_0 = P_0L$, where $L = (6 + 0.03R_0)$″.

If all legs of the cat have the same cross-sectional area, calculate the axial force on each leg.

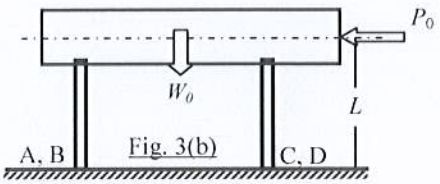


Fig. 3(b)

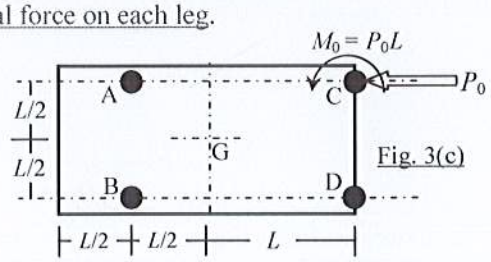


Fig. 3(c)

4. Calculate the equivalent polar moment of inertia (J_{eq}) for the cross-sections shown in Figs. 4(a), (b), (c) by centerline dimensions [Given: $x = (1 + 0.01R_0)'$, Wall thickness = 0.10′ throughout].

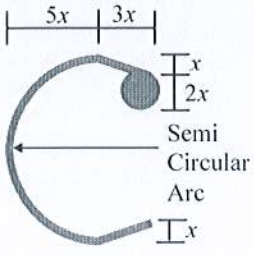


Fig. 4(a)

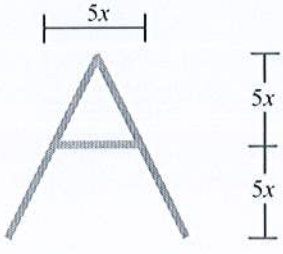


Fig. 4(b)

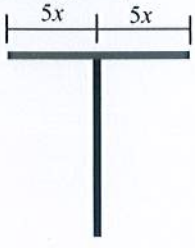


Fig. 4(c)

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Spring – 2022
Program: B.Sc. Engineering (Civil)

Course Title: Fluid Mechanics | Course Code: CE 221
Time: 1 hour | Credit Hour: 03 | Full Marks: 60

There are 4 questions with 15 marks for each. Please answer them accordingly.
[Assume reasonable data if and when needed]

1. a) Define and provide mathematical expressions for (i) specific weight; (2) specific volume and (3) specific gravity (4) Bulk Modulus — **7**

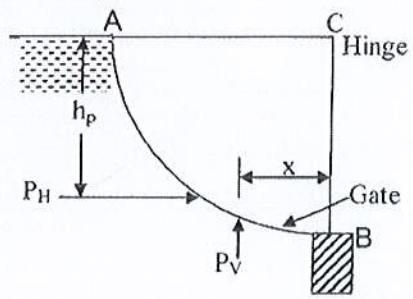
c) Define and briefly explain different flow types for the following criterion (a) viscosity and velocity; (b) time; (c) space; (d) density — **8**

2. a) Derive and prove that for a static fluid, pressure varies with elevation z and constant in horizontal xy planes. — **7**

b) Derive the mathematical expressions for equation of continuity for steady and unsteady flow with figure. — **8**

3. a) A fluid has a dynamic viscosity of 0.5 poise. Calculate the velocity gradient and the intensity of shear stress at the boundary. The fluid is filled between two parallel plates 5.0cm apart, and one plate is moving at a velocity of 1m/s while the other plate is stationary. The distribution of velocity is, $U = 100 - k(5-y)^2$ — **6**

b) Find the total pressure force acting on the gate per meter length in the figure. The gate is a quadrant of a circle of radius 2m. Also, find out the angle of the total forcing with the horizontal and Prove that the resultant force passes through the hinge C. — **9**



4. (a) Give two examples (each) of fluid statics and kinematics in real life engineering and scientific applications with brief explanations. — **6**

(b) Provide and explain real life examples of how steady flow can change into unsteady flow and how unsteady flow can become steady flow? — **5**

(c) Give two real life examples of application of surface tension and cohesive forces. — **4**