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University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination, Spring 2025
Program: B.Sc. in Civil Engineering
2nd Year 2nd Semester

Course Title: Applied Mathematics for Engineers
Time: 1 hour

Credit Hour: 3.00

Course Code: MTH 203
Full Marks: 60

Answer all the questions

QUESTION 1 [10 MARKS]

Find the Laplace transformation of error function, $\text{erf}(\sqrt{t})$ and prove that $L \{ \text{erf} \sqrt{at} = \frac{\sqrt{a}}{s\sqrt{(s+a)}} \}$

QUESTION 2 [10 MARKS]

Find the Laplace transformation of $\frac{e^{-2t} \cos^2 \frac{t}{2}}{t^2}$.

QUESTION 3 [10 MARKS]

Determine $L^{-1} \left\{ \frac{1}{s^2(s+4)^2} \right\}$.

QUESTION 4 [10 MARKS]

Form a PDE from $\phi(2x^2 - 3y^2 + z^2, x^2 + y^2 - 2z) = 0$.

QUESTION 5 [10 MARKS]

Determine the general solution of the linear partial differential equation

$$z(z^2 + xy)(px - qy) = x^4$$

QUESTION 6 [10 MARKS]

Find the complete integral of non-linear partial differential equation $\sqrt{p} - \sqrt{q} + 3x = 0$.

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Mid Semester Examination, Spring 2025
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Course Title: Engineering Economics
Time: 1.00 Hour

Credit Hour: 3.00

Course Code: ECN 201
Full Marks: 60

Answer all the questions.

QUESTION 1 [20 MARKS]

- a. Describe different types of price elasticity of demand. [10]
- b. "When demand is price inelastic a price increase reduces total revenue"- justify the statement. [10]

QUESTION 2 [20 MARKS]

Calculate elasticity and give interpretation. [20]

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

QUESTION 3 [20 MARKS]

- a. $Q = 100 - 2P$ [10]
 $Q = 50 + 2P$
Calculate equilibrium price and quantity.

- b. Explain the effect of change in income on equilibrium. [10]

OR

- a. $Q = 50 - 2P$ [10]
 $Q = 10 + 2P$
Calculate equilibrium price and quantity.

- b. Explain the effect of change in input price on equilibrium. [10]

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Department of Civil Engineering
Mid Semester Examination, Spring 2025
Program: B.Sc. in Civil Engineering
2nd Year 2nd Semester

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

Answer all the questions

QUESTION 1 [10 MARKS]

While performing an experiment in geotechnical lab at UAP, students found this equation

$$x^4 - \cos(0.5x) - 5 = 0$$

[10]

Find the **root** of the above equation using **Newton Raphson Method** assuming $x_0 = 1$

QUESTION 2 [10 MARKS]

In geotechnical engineering lab, during cone penetration test the following data of Cone Penetration (mm) vs water content (%) are observe. [10]

Water content (%) = x

Cone Penetration (mm) = y

Water content (%)	16	18	22	25	30
Cone Penetration (mm)	33.1	40.2	53.9	62.8	80.1

Determine the **equation of an exponential curve** in the form of $y = ax^b$, using the tabular data.

QUESTION 2 [20 MARKS]

In transportation engineering lab, the following data of Trip Count vs Gross Floor Area are observed. [20]

Gross Floor Area (GFA) = x

Trip Count = y

Gross Floor Area (In thousand sft)	2	4	6	8	10
Trip Count (in thousand)	3	4.5	5	7.5	8

Determine the **equation of a parabola** in the form of $y = a + bx + cx^2$, using the tabular data. For determination of a, b and c use **Gauss Jordan Elimination method**.

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Course Title: Fluid Mechanics
 Time: 1 hour

Credit Hour: 03

Course Code: CE 221
 Full Marks: 60

There are 3 questions. Please answer them accordingly.

[Assume reasonable data if and when needed]

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|----|-----|--|----|
| 1. | a) | Define and mathematically explain convective acceleration and local acceleration in steady and unsteady fluid flow | 5 |
| | b) | Define different flow types for the following criterion (i) viscosity and velocity; (ii) time; (iii) space; (iv) density (v) enclosure | 10 |
| 2. | a) | Derive how pressure varies in only one direction in static fluid. | 15 |
| 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, $U = 100 - k(5-y)^2$. | 8 |
| | 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. | 15 |
| | (c) | King Hiero ordered a new crown to be made from pure gold. When he received the crown, he suspected that other metals had been used in its construction. Archimedes discovered that the crown required a force of 4.7 lb to suspend it when immersed in water, and that it displaced 18.9 in ³ of water. He concluded that the crown was not pure gold. Do you agree? Explain. | 7 |



