



ELIZADE UNIVERSITY, ILARA-MOKIN

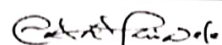
FACULTY OF BASIC AND APPLIED SCIENCES  
DEPARTMENT: PHYSICAL AND CHEMICAL SCIENCES

**PROGRAMME: APPLIED GEOPHYSICS EXAM TITLE: DEGREE EXAMINATION**  
**COURSE CODE & TITLE: AGP 206 – INTRODUCTORY GEOMATHEMATICS**

**TIME ALLOWED: 2 Hrs 30 mins. SEMESTER/SESSION: 2<sup>nd</sup> SEMESTER / 2020/2021**

**INSTRUCTIONS:**

1. Write your matriculation number in the space provided above and also on the cover page of the exam booklet.
2. This question paper consists of 2 pages including this page.
3. Answer any four questions.

  
HOD's SIGNATURE

1. (a) For a Legendre polynomial,  $P_n(x)$ ; evaluate the values for  $P_1(x)$  and  $P_3(x)$   
(b) Sketch the graph of the equation  $y = x^2 - 4x + 7$  i.e. for  $-3 < x \leq 3$  and determine its  
(i) vertex (ii) intercept at both x and y axes.

20 Marks

2. (a) Determine the Fourier series for a periodic function

$$f(x) = \begin{cases} -2 & -\pi < x < 0 \\ +2 & 0 < x < \pi \end{cases}$$

- (b) Sketch the following mathematical functions

$$(i) f(x) = \begin{cases} 1 & -2 \leq x \leq 1 \\ 2 & -1 \leq x \leq 0 \\ 3 & 0 < x < 2 \end{cases} \quad ; \quad (ii) f(x) = \begin{cases} 0 & x < -2 \\ -3 & -1/2 \leq x \leq 1/2 \\ 1 & x > 1 \end{cases}$$

20 Marks

3. The relationship between the voltages applied to an electrical circuit and the current flowing is as shown

X (volt)	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
Y(mA)	3.9	4.4	5.8	6.6	7.0	7.1	7.3	7.7

- (a) Plot a scatter diagram of current, y, against amount of voltage, x.  
(i) Calculate the equation of the least squares regression line of y on x  
(ii) Estimate the current flow assuming a voltage of 2.0 volts is applied

(b) Determine the product moment correlation coefficient.

20 Marks

4. (a) Assuming  $p = 3i + j - k$  and  $q = i - 4j + 2k$  determine:

(i)  $p \cdot q$  (ii)  $p + q$  (iii)  $|p + q|$  (iv)  $|p| + |q|$

(b) Plot the mathematical function  $f(x) = -3x^2 + 12x - 15$

20 Marks

5. (a) Use the method of inverse to solve the following set of simultaneous linear equations:

$$x + 2y + z = 4$$

$$3x - 4y - 2z = 2$$

$$5x + 3y + 5z = -1$$

(b) Find the solution using Laplace equation of cylindrical coordinate for a scalar potential field,  $U$  with single variable,  $r$  and independent of  $\theta$ .

20 Marks

6. (a) Derive the Legendre's equation  $(1 - x^2) y'' - 2xy' + (n + 1) = 0$  for a function  $G$  representing an ore body in the shape of a sphere, independent of azimuth angle  $\Phi$ .

(b) Explain the importance of Laplacian coordinates in geophysical interpretation.

20 Marks