FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
SCHOOL OF PHYSICAL SCIENCES
DEPARTMENT OF GEOLOGY

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BTech GEOLOGY
2017/2018 SESSION

COURSE CODE: GEL 324 **UNIT:** 2

COURSE TITLE: PRINCIPLES OF GEOPHYSICS

INSTRUCTIONS: ANSWER QUESTION ONE AND ONE QUESTION EACH FROM SECTIONS A AND B

TIME ALLOWED: 2 HOURS **DATE:** 13TH APRIL, 2018

PRACTICAL

1. The data below was generated from a geological formation during one of the GEL 324 practical fieldwork.

Fill in the table and answer the following questions.

S/No	Electrode spacing AB/2	Locations ρ_a	ρ_b
1	1.00	81	178
2	2.00	132	126
3	3.00	125	118
4	5.00	103	84
5	6.00	90	79
6	6.00	89	81
7	8.00	74	75
8	10.00	67	82
9	10.00	60	83
10	15.00	52	80
11	20.00	45	81
12	30.00	65	130
13	40.00	105	188
14	40.00	20	222
15	50.00	120	269
16	60.00	189	349
17	70.00	191	422
18	80.00	230	476
19	80.00	210	582
20	90.00	280	598
21	100.00	301	650

i. Using the data presented above, answer the following questions:
ii. Plot the appropriate graphs
iii. What is the approximate depth of the overburden in each location?
iv. How many layers are there in each case?
v. Identify the terrains with reasons?
vi. Write the geological names of the layer(s) you may find.
vii. Arrange locations A and B in other of productivity if the two are to be drilled.
viii. If the subsurface is to be exploited, at what depth will you encounter fresh rock?
ix. If the subsurface is drilled, will the data give productive borehole?
x. What are the major problems encountered during the practical fieldwork exercise?

SECTION A

2. (a) Name a geophysical surveying method and how you will use it to solve water problem in F.U.T. Minna, Bosso Campus?

(b) Outline:
i. the differences between Schlumberger and Werner array methods.
ii. the principles and limitations of self-potential surveying method.
iii. the applications of electric resistivity surveying method.

3. (a) State the resistivity equation for Werner configuration and proof the resistivity equation: $\rho = \frac{\pi r^2}{I} \cdot \frac{\Delta V}{\Delta r}$

(b) Draw the:
i. four electrode array.
ii Werner configuration and Schlumberger configuration.

(c) i. Explain the term apparent resistivity.
ii. What are the limitations of Induced Polarization surveying method?

SECTION B

1) a. State the Law of Universal Gravitation.
b. State Newton's Second Law.
c. Using the Law of Universal Gravitation and Newton's Second Law, derive an expression for the acceleration of gravity.
d. A spherical cavity of radius 8 m has its centre 15 m below the surface. If the cavity is full of water and is in rocks of density 2400 kg/m^3, what is the maximum size of its anomaly?

2) a. Calculate the acceleration due to gravity, g, on Mars to the nearest 0.01 m/s^2. Assume: mass of Mars is 6.42x10^{23} kg, Mars radius is 3397 km, and the universal gravitational constant is 6.67x10-11 m^3·kg^{-1}·s^{-2}.

b. What are the advantages and disadvantages of aeromagnetic surveys in comparison to ground level ones?
c. Sketch the anomaly of a buried sphere with induced magnetisation at the south magnetic pole.
d. What is the advantage of a magnetic anomaly being 'reduced to the pole'?