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

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

COURSE CODE: GEL 512 **UNIT:** 3

COURSE TITLE: APPLIED GEOPHYSICS

INSTRUCTIONS: ANSWER FOUR QUESTIONS IN ALL. ANSWER QUESTION ONE (1) AND ANY OTHER IN SECTION 'A' AND ANY TWO QUESTIONS FROM SECTION 'B'.

TIME ALLOWED: 2 HOURS 30 MIN. **DATE:** 26 APRIL 2018

SECTION A

1 Practical

(a) The following data were generated from three locations in Minna.

S/No	Electrode spacing AB/2	Locations ρ_a	ρ_b	ρ_c
1	1.00	81	178	199
2	2.00	132	126	315
3	3.00	125	118	370
4	5.00	103	84	303
5	6.00	90	79	250
6	6.00	89	81	260
7	8.00	74	75	200
8	10.00	67	82	195
9	10.00	60	83	185
10	15.00	52	80	250
11	20.00	45	81	320
12	30.00	65	130	345
13	40.00	105	188	378
14	40.00	90	222	382
15	50.00	120	269	390
16	60.00	189	349	300
17	70.00	191	422	190
18	80.00	230	476	140
19	80.00	210	582	130
20	90.00	280	598	90
21	100.00	301	650	79

Using the data presented above, answer the following questions:
Plot the appropriate graphs.

(i) What is the approximate depth of the overburden in each location?
(ii) How many layers are there in each case?

(iii) Identify the terrains with reasons?
(iv) Write the geological names of the layer(s) you may find.
(v) Arrange locations A B C in order of productivity if all the three are to be drilled for water.

(20 marks)

2 Write short notes:
(i) Werner and Schlumberger array
(ii) SP and IP methods
(iii) Advantages and disadvantages of Electromagnetic method.

(10 marks)

3
(a) How would you search for water in both basement and sedimentary terrains?

(b) Arrange the following in order of decreasing (i) electrical resistivity and (ii) density
Gabbro (wet), galena, ilmenite, shale, magnetite, chalcopyrite, sphalerite, and granite (wet)

(10 marks)

SECTION B

1(a) (i) Define applied geophysics.
(ii) Give illustrated explanation of how the limitations of geological methods are overcome by applied geophysics.

(b) (i)What are natural field methods
(ii) List three advantages of the natural field methods over artificial field method

(c) (i) Explain ambiguity in the interpretation of geophysical data.
(ii) Give an illustration of how ambiguity can be overcome in the interpretation of geophysical data

2 (a) Define the following:
(i) Seismic wave
(ii) Seismic source

(b) (i) Give two examples of a seismic source
(ii) Explain the concept of compressional waves

(iii) What factors govern the propagation of seismic waves in a given material?

(iv) State the formula for the propagation velocity of compressional waves in the subsurface

(c) Identify the stratigraphic features and one structural feature in Figure 1 (attached)

3 (a) Explain how a critically refracted ray is generated from an obliquely incident compressional wave.
(b) Explain how seismic energy is returned to the surface from a critically refracted ray
(c) In an attempt to determine the depth to bedrock at dam site, the seismic refraction data in Table 1 were obtained. Study the data and calculate the depth to bedrock.

Table 1. Offset distance and arrival times of seismic refraction data for a dam site.

Offset distance x (m)	Arrival time t (ms)
15	19
30	29
45	39
60	50
75	59
90	62
105	65
120	68
135	72
150	76
165	78
180	82