UNIVERSITY OF PETROLEUM & ENERGY STUDIES

End Semester Examination – December, 2017

Program/course: B.Tech CS-OG	**Semester : VII**
Subject: Geophysical Data Acquisition, Processing & Interpretation	**Max. Marks : 100**
Code : GSEG-403	**Duration : 3 Hrs**
No. of page/s: 02	

SECTION A: **Answer all the questions.**   **[4*5=20 marks]**

1. Draw KH type of 4-layer master curve and also give the relationship between the resisitivities?

2. Gravity observations were taken at the base and at the roof of a library by suspending a gravimeter in air and the values obtained are 0.990 mGal and 0.970 mGal. Find out the height of the library building.

3. Which type of 4 layer master curve will form for the given sequence also give the relationship between the resistivities

Dry Soil
Wet soil
Hard rock
Saline water aquifer

4. What do you understand by Bouguer correction in gravity data? What will be the value of Bouguer correction for a point having an elevation of 50 m and density contrast of 0.5 g/cc?

SECTION B: **Answer all the questions.**   **[4*10=40 marks]**

5. a. What do you understand by stacking of seismic data? Briefly explain how stacking of seismic data helps in removal of non-coherent noise. [05 marks]
   b. Briefly explain the X^2-T^2 method of velocity analysis. [05 marks]

6. What are Direct Hydrocarbon Indicators? Briefly explain bright spot, flat spot and pull down.

7. a. Derive an expression for acceleration due to gravity. Briefly explain why the value of 'g' is not constant on Earth's surface? [03+02 marks]

b. What do you understand by drift correction in gravity data? How the drift correction is calculated? [02+03 marks]

8. a. Derive an expression for acceleration due to gravity for a spherical body.

b. The peak gravity anomaly over a 2D line mass of circular cross section of density contrast 500 kg/m³ is 1.674 mGal. The anomaly decreases to 0.837 mGal at distance of 500 m along a principle profile then find out the depth to the line mass.

SECTION C: **Answer all the questions.**   **[20*2= 40 marks]**

9. a. Derive an expression for apparent resistivity using 4-electrode configuration with constant distance 'x' between two consecutive electrodes. [10 marks]

b. What is a difference between electrical sounding and profiling? Briefly explain how sounding can be done in the field using 4-electrodes in Wenner configuration. [04 marks]

c. Briefly explain the process for interpretation of HK type for layer master curve. [06 marks]

10. a. A gravity survey is conducted over a highly compacted ore deposit (spherical shape). Bouguer anomaly values reduced along a profile are given below.
    a. What is the depth to the center of ore deposit?
    b. What is excess mass in metric tons by the deposit?

Distance (m)	Gravity anomaly (mGal)	Distance (m)	Gravity anomaly (mGal)
0	0.25	3600	4.00
400	0.35	4000	3.50
800	0.50	4400	2.60
1200	0.80	4800	1.50
1600	1.50	5200	0.80
2000	2.60	5600	0.50
2400	3.50	6000	0.35
2800	4.00	6400	0.25
3200	5.00		

OR

a. Calculate the thickness of the following rock types required to give an Bouguer anomaly of 1 mGal and 10 mGal assuming the country rock density is 2750 kg/m³ [10 marks]
    a. Granite (2650 kg/m³)
    b. Triassic sandstone (2350 kg/m³)

b. What do you understand by convolution and deconvolution? Why deconvolution of seismic data is required? [10 marks]

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**SECTION A: Answer all the questions.**   **[4*5=20 marks]**

1. What is the SI unit of the gravity data? What is the relationship between the SI unit and the practical unit of gravity data?
2. What is Hockey stick effect? How it is corrected?
3. Why subsurface resistivity is measured instead of resistance? Why the measured resistivity is known as apparent resistivity?
4. What type of 3-layer master curve will form for a subsurface having dry soil on the top followed by a wet soil over a saline water aquifer?

SECTION B: Answer all the questions.   **[4*10=40 marks]**

5. What are DHIs? For the model given below sketch a stack seismic response showing appropriate DHI's.
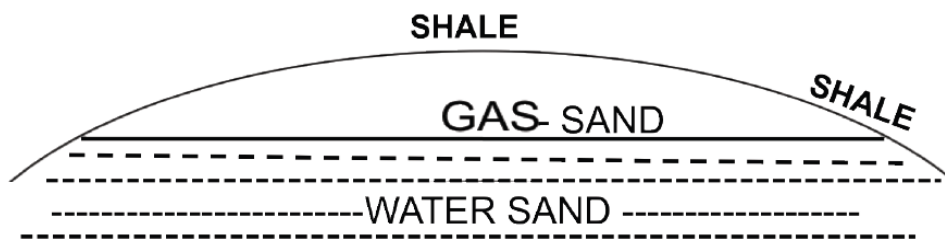
6. What do you understand by free air correction? Derive an expression for free air correction.
7. What do you understand by static correction in seismic data? Derive an equation for static correction?
8. What is a difference between electrical sounding and profiling? Briefly explain how sounding and profiling can be done in the field using 4-electrodes in Wenner configuration.

9. a. Draw the all four types of 3-layer master curve for electrical sounding? [04 marks]

    b. Derive an expression for apparent resistivity using 4-electrode configuration for Schlumberger configuration. [12 marks]

    c. A Wenner array with 60 m spacing between two consecutive current electrodes is placed over an inhomogeneous ground. If the measured potential difference and current flow in subsurface are 10 mV and 5 mA, respectively. What will be the resistance and the apparent resistivity of the subsurface? [04 marks]

10. a. Derive an expression for acceleration due to gravity for a spherical body. A spherical cavity of radius 8 m has its centre 15 m below the surface. If the cavity is full of sediments of density 1.5×10^3 kg/m3 and is in a rock body of density 2.4×10^3 kg/m3. What is the maximum value of its gravity anomaly in mGal? [10 marks]

    b. What do you understand by NMO correction? Derive an expression for NMO correction for a flat reflector [10 marks]

    <div align="center">OR</div>

    a. Write a short note on acquisition of seismic data and hence define what is fold in seismic data acquisition? [10 marks]

    b. Draw a flowchart for the seismic data processing sequence and briefly explain all the steps. [10 marks]