(b) Show that fundamental differences between the gradient and the total field methods used for measuring self-potential with relevant sketches. 3+2

GROUP - B (25 marks)

9. Answer any ***five*** questions : 5x5

(a) Discuss the external magnetic fields that affect the magnetic survey.

(b) How does the magnetic anomaly look like if a magnetized sphere is buried somewhere at the Equator ? Explain with a diagram.

(c) What are the advantages and disadvantages of seismic methods ?

(d) Describe the mechanism for induced magnetization that affects the natural rocks.

(e) What are the advantages of refraction methods in mineral exploration ?

(f) Describe a Proton Precession Magnetometer with a schematic diagram.

(g) Discuss the nature of different seismic waves.

(h) What is Aeromagnetic Survey ? Describe he geometry of Flight Patterns in aeromagnetic survey.

(i) Discuss about the height of Flight Path in Aeromagnetic Survey.

Ex./M.Sc.II/G-2/XI/6/2019

MASTER OF SCIENCE EXAMINATION, 2019

(2nd Year, 1st Semester)

APPLIED GEOLOGY

Geophysical Exploration

Paper : - XI

Time : Two hours Full Marks : 50

Use a separate answer script for each group.

GROUP - A (25 marks)

Answer any ***five*** questions. 5x5=25

1. (a) Using suitable sketches express the spatial position of a mass point in a spherical and a cylindrical reference frame.

(b) Derive the equation to show the mass (dm) of an infinitesimal volume element chosen in a spherical space. Assume that the material density is $\rho(r)$.

(c) Use the same equation to express the g value for a spherical body of radius, a (you need not solve the integration). 2+2+1

2. (a) Show that the gravity at a point outside the Earth is :

$$g = \frac{GM}{r2} + g_{r/} ,$$

where M is the total mass, G is the universal gravitational constant, r is the radial distance of the point from Earth's center and $g_r^{/}$ represents the radial component of the gravity due to excess mass associated with the distorted shape of the Earth.

(b) Determine the total moment of inertia for the Earth, assuming its axisymmetric shape. 2+3

3. (a) Explain the effect of Earth's rotational motion on the gravity field.

(b) Derive the equation used to define the gravitational equipotential surface.

(c) Define the term gravity potential and express the geoid anomaly at a point on Earth's surface. 2+1+2

4. (a) A sedimentary terrain has salt dome of radius R at a depth of d. The density contrast between the salt dome and the ambient sedimentary rock is $\Delta\rho$. Derive an equation to show the location of maximum gravity anomaly due to the salt dome, and determine the magnitude of this maximum anomaly.

(b) Show the variation in graphical plots of gravity anomaly versus horizontal distance for increasing d, Explain your answer with an appropriate mathematical basis. 3+2

5. A linear, horizontal ore body of cylindrical shape is located at a depth, d.m is its mass per unit length. Find the gravity due to this ore body measured at point on the ground surface. Assume that the ore body is infinitely extended. Use all other physical parameters applicable to this mathematical problem. 5

6. (a) A veritical ore body of cylindrical shape occurs at a depth, Z. Derive the equation for gravity anomaly as a function of ore body length, L and radius R, and density contrast, $\Delta\rho$.

(b) Use the same equation to show the gravity anomaly when $R \rightarrow \alpha$. 4+1

7. (a) With help of a neat sketch explain the operational principle of Michelson interferometer used in gravity measurements.

(b) Describe schematically the torsion balance and used in measurement of horizontal gravity component. 3+2

8. (a) Explain the model of the origin of the self-potential anomaly of an ore body. Answer with a suitable sketch. 3+2