2021

GEOLOGY — HONOURS

Paper : DSE-B-2

(Introduction to Geophysics)

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Question nos. **1** and **2** are compulsory and answer ***any three*** from the rest.

1. Choose the correct answer from the given options — 1×10

i) Uraninite prospecting is done using —

(a) Gravity method (b) Magnetic method

(c) Radioactive method (d) Seismic method.

ii) Presence of ore deposits in host rock is detected by studying —

(a) Regional anomaly (b) Residual anomaly

(c) Total anomaly (d) True anomaly.

iii) Suitable foundation structure for dam sites should have

(a) Low electrical resistivity (b) High electrical resistivity

(c) Very low electrical resistivity (d) Gravity low.

iv) Which one of the following conditions indicates presence of groundwater in weathered gneissic rock?

(a) High electrical resistivity (b) High magnetic susceptibility

(c) Very high gravity anomaly (d) Low electrical resistivity.

v) What is the assumption of the multilayer seismic refraction study related to the seismic velocity in different layers?

(a) Increase in velocity with depth (b) Decrease in velocity with depth

(c) No change in velocity with depth (d) Decrease in density with depth.

vi) Low gravity anomaly is *not* observed over

(a) Sedimentary basin b) Basaltic traps

(c) Normal fault (d) Bauxite deposit.

vii) Direct wave in seismic study indicates the seismic velocity of the

(a) Top layer (b) Bottom most layer

(c) Intermediate layer (d) Low velocity layer.

viii) Schlumberger electrical arrangement is used to get

(a) Electrical resistivity tomography (b) Lateral electrical resistivity variation

(c) Electrical resistivity profiling (d) Vertical electrical resistivity variation with depth.

ix) Passive electrical geophysical exploration technique includes

(a) Induced Polarization method (b) Resistivity method

(c) Self potential method (d) Wenner method.

x) Isostatic correction in gravity method is mandatory while studying over

(a) Shield area (b) Folded younger mountain belt

(c) Ocean floor (d) Sedimentary basin.

2. Answer ***any five*** of the following questions : 2×5

i) What is the Bouguer gravity anomaly?

ii) From the following list, mention the mineral(s) that can be detected using gravity method – Graphite, Galena, Barite, Magnetite, Bauxite, Stibnite, Phlogopite.

iii) What is magnetic susceptibility? State its unit.

iv) What is cross-over distance in seismic refraction study?

v) State the spacings of electrodes in Wenner resistivity method. Mention the unit of resistivity.

vi) Mention the portion of the total geophysical anomaly which is used for regional geophysical study. Give reason.

vii) State two major factors that control the magnitude of geophysical anomaly.

viii) 'Geology and geophysics are highly interrelated' – Briefly justify the statement.

3. Briefly discuss the application of integrated geological and geophysical data in explaining the geodynamical features of the earth. 10

4. Describe the Free Air Correction and Bouguer Correction in gravity method of geophysical exploration. Why terrain correction is always positive? (3+3)+4

5. State the differences between electrical profiling and electrical sounding techniques in electrical resistivity method of geophysical exploration. Arrange the following materials in order of increasing electrical resistivity – Natural gas, Saline water, Petroleum and Fresh water. 8+2

6. Briefly discuss the application of geophysical methods in ore mineral prospecting. 10

7. What is geophysical anomaly? Mention the differences between the regional anomaly and residual (local) anomaly. Discuss the significance of residual anomaly in geophysical exploration method. 2+4+4

8. Draw the relevant curves (with equations) for Direct Wave and Refracted Wave in Time(t)-Distance(x) graph for seismic study in geophysical exploration in horizontal two-layer system. Determine (i) the seismic velocities of the top and the bottom layer and (ii) the vertical depth of the horizontal interface of the two layers from the flat even ground surface from the drawn curves. 6+2+2
