B. Sc. Geological Science Examination, 2025

(2nd Year, 1st Semester)

GEOLOGY

Paper : CORE/TH/06

(Igneous Petrology)

Time : *Two Hours* *Full Marks* : 40

Use separate Answer-Scripts for each Part.

PART—I

(20 Marks)

Answer *any* **four** questions. All questions carry equal marks. 5×4=20

1. What is phase rule? What would be the number of phases at invariant and univariant conditions in a one-component system? Give an example of one component system with illustration. Mark the invariant point and univariant line in the illustration.

2. Draw a schematic isobaric section of diopside-anorthite phase diagram and label it properly. Describe the equilibrium crystallization history of a melt that is rich in diopside component.

3. Discuss the Bowen's reaction series.

4. What are M-type and I-type granites? Discuss the origin of these granites. In which tectonic set up do they form?

5. Write a short note on any one of the following :

   (a) Hypersolvus and subsolvus granite

   (b) Compositional zoning in plagioclase

6. What is the mechanism of magma formation in the subduction zone system? Discuss it with a suitable figure.

7. What are the differences between a peritectic point and a eutectic point? Explain it with a suitable phase diagram.

PART—II

(20 Marks)

Answer *any* **two** questions. All questions carry equal marks. 10×2=20

1. *(a)* What are the sources of mantle rocks on earth's surface? Discuss the mineralogy of upper mantle rocks.

   (b) What causes mantle rocks to melt?

   (c) Do you think the cause of magma generation in oceanic islands and island arcs are the same? Answer with reasons. 3+3+4 **[CO1+CO3]**

2. *(a)* Identify the different tectonic set ups where we can expect alkali basaltic magma.

   (b) What is 'Plane of silica saturation' in Basaltic Tetrahedron? Draw the Basaltic Tetrahedron and place the following rocks within it :

   (i) Norite

   (ii) Olivine basalt

   (iii) Quartz tholeiite

   (iv) Alkali olivine basalt

   (c) Discuss the role of pressure, H_2O and CO_2 in generation of Tholeiitic and Alkali Basaltic magma through partial melting of mantle rocks. Draw appropriate diagrams where necessary. 2+4+4 **[CO4+CO3]**

3. *(a)* 'Ferro-basalt appears as an intermediate member during differentiation of Tholeiitic magma, but completely absent in differentiation of Calc-alkaline magma in arc set up'— why? Answer with reasons.

   (b) 'MORB is a product of high degree of partial melting of Depleted mantle'— explain with reasons. 5+5 **[CO4+CO5]**

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