Question Paper Specific Instructions

Please read each of the following instructions carefully before attempting questions:

There are EIGHT questions in all, out of which FIVE are to be attempted.

Questions no. 1 and 5 are compulsory. Out of the remaining SIX questions, THREE are to be attempted selecting at least ONE question from each of the two Sections A and B.

Attempts of questions shall be counted in sequential order. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.

All questions carry equal marks. The number of marks carried by a question/part is indicated against it.

Answers must be written in ENGLISH only.

Neat sketches may be drawn, wherever required.
SECTION A

Q1. (a) Classify the various ‘silicate structures’ with neat diagrams. 8
(b) Explain ‘Gibbs Phase Rule’ and its applications in geothermobarometry. 8
(c) Differentiate between the textures and mineral assemblages developed during regional metamorphism of pelitic sedimentary rock to amphibolite and granulite facies. 8
(d) Compare the texture and mode of emplacement of gabbro, dolerite, basalt and komatiite. 8
(e) Describe the changes that take place during transformation of sediments to sedimentary rocks. 8

Q2. (a) What are primary sedimentary structures? Write a note on the significance of ripple marks in terms of sedimentary environment. 15
(b) Explain the concept of metamorphic facies with suitable diagram and write a note on metamorphic facies related to contact metamorphism. 15
(c) What is eutectic crystallization? Show the behaviour of eutectic crystallization in the binary system, giving appropriate example. 10

Q3. (a) What are biaxial interference figures? Explain how interference figures are obtained under conoscopic condition and add a note on types of biaxial interference figures. 15
(b) Write an elaborate note with neat diagram on mineralogical composition and texture of common mafic and felsic igneous rocks. 15
(c) Elaborate the classification scheme and petrographic characteristics of sandstone. 10

Q4. (a) Explain the symmetry configuration of ‘Normal Class’ of ‘Orthorhombic System’ and discuss the characteristic forms. 15
(b) How are amphibole and pyroxene distinguished based on crystal structures and optical properties? 10
(c) Write mineral composition and texture of the following rocks — charnockite, phosphorite and limestone. 15
SECTION B

Q5. (a) How are early and late magmatic ore deposits distinguished? Give your answer with suitable examples.
   
   (b) What are the salient features of 'National Mineral Policy'? Discuss with special emphasis on 'Strategic Minerals'.
   
   (c) Write briefly about classification and geochemical distribution of the elements in the Earth's crust.
   
   (d) Write about the source, speciation and fixation of 'Arsenic Contamination' in groundwater, with special emphasis to the Indian context.
   
   (e) Assuming the specific gravity of 4.1 and average grade of 54.1% Fe, calculate the total tonnage of iron ore and metallic iron content in a 10 m thick and 50 m wide iron ore body with a strike length of 500 m.

Q6. (a) What is coalification process and how is it related to different ranks of coal?
   
   (b) What are the different methods of sampling practised during mineral exploration and mining? Give reasons for choice of sampling method followed in different types of ore deposits.
   
   (c) What is acid mine drainage? Briefly explain its environmental consequences and controlling measures.

Q7. (a) Elaborate the process of origin, migration and trapping conditions for hydrocarbon.
   
   (b) Write the salient points of interpretation of electrical resistivity data and discuss suitability of the electrical resistivity method for groundwater exploration.
   
   (c) Give a brief account of mineral resources in 'Exclusive Economic Zone' (EEZ) of India.
Q8. (a) Write a note on geographical distribution, mineralogy, mode of occurrence and origin of lead-zinc (Pb – Zn) ore deposits in India.

(b) Write a note on methods of radioactive waste disposal with special reference to geological parameters.

(c) Distinguish between 'Chondrite' and 'Achondrite' and describe the 'Carbonaceous Chondrite'.