Bachelor of Metallurgical Engg. Examination, 2024
2nd Year, 1st Semester
GEOLOGY AND MINERALS BENEFICIATION

Time: Three Hours | Full Marks: **100**
(**50** marks for each part)

Part-I

Use Separate Answer scripts for each part.
Answer Question No.1 & 2 and any TWO from the rest

1. Choose the correct answer: **1.5 X 10 = 15**

i. The softest mineral known as per Mohs scale is
   a) Quartz
   b) Orthoclase
   c) Talc
   d) Calcite

ii. Which of the following does not correspond with the others given in the series?
   a) Hornfelses
   b) Slate
   c) Schist
   d) Phyllite

iii. Explosive eruptions often involve rhyolitic magmas. This is because of their
   a) High silica content
   b) High water content
   c) Low volatile solubility
   d) Deep-seated nature

iv. Which of the following is directional property of mineral?
   a) Hardness
   b) Cleavage
   c) Streak
   d) None of these

v. Which physical properties of a given mineral displays the greatest variation
   a) colour
   b) hardness
   c) luster
   d) streak

vi. Wackes are characterised by
   a) Higher proportion of matrix
   b) Lower proportion of matrix
   c) Absence of matrix
   d) Equal amounts matrix and cement

vii. Which of the following mineral is not part of the discontinuous reaction series?
a) olivine
b) pyroxene
c) amphibole
d) plagioclase

viii. Identification of Calcite in sedimentary rock can be done by using
a) the rock will glow in the dark
b) the rock will break to form smooth surfaces
c) hydrochloric acid will cause the calcite to fizz
d) the rock will taste salty

ix. 'Luster' is defined as the appearance of of a mineral in
a) White light
b) Monochromatic light
c) Incident light
d) Reflected light

x. Hardness of minerals increases with a/an
a) Increase in valency
b) Increase in bond strength
c) Increase in density of packing atoms
d) All of the above

2. Define mineral. Is coal a mineral? Arrange the following minerals in order of decreasing hardness-Apatite, Diamond, Fluorite and Gypsum. Why only oxide and sulphide minerals are used for extraction of metals? How do you distinguish between Igneous, sedimentary and metamorphic rocks? **15**

3. Write the difference between the cleavage and fracture. Why the hardness of minerals is considered as a vector property? Distinguish between Talc and Kyanite on the basis of their physical properties and underline their diagnostic properties. **10**

4. a) Group the following minerals under the classes- **10**
i) Oxides ii) Sulfides iii) Silicates and iv) Carbonates:
Quartz, Magnetite, Pyroxene, Calcite, Galena, Haematite, Pyrite, Garnet, Biotite, Pyrolusite
b) Arrange the following rocks according to decreasing SiO_2 content:
Gabbro, Rhyolite, Peridotite
c) Is continental crust thinner than oceanic crust? What is the bulk composition of oceanic crust?

5. Why only oxide and sulphide minerals are used for extraction of metals? What is 'placer deposit'? Define the terms metallic & non-metallic deposits, ore mineral, gangue minerals, hypogene & supergene deposits with suitable examples. Why Chromite is considered as 'strategic' mineral?

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Ref. No. : Ex/Met/ES/B/Geo-Met/TS/215/2024

Name of the Examinations: B.E. METALLURGICAL AND MATERIAL ENGINEERING SECOND YEAR FIRST SEMESTER - 2024

Subject: GEOLOGY AND MINERALS BENEFICIATION

Time: 3hrs. **Full Marks: 100**

Group / Part – Part II

Instructions: Use Separate Answer scripts for each Group/part / Attempt all the questions answer from each "CO" is mandatory following the given instruction

COI: (Answer any four questions from CO I)

1. Why comminution process is very important for the mineral beneficiation industry? How does the energy requirement for breaking the particles become very important? Explain. 2+3=5
2. How is the energy calculated from Kick's law? Make a comparison between the different types of jaw crushers according to their position of jaw pivoted. 2+3=5
3. Explain the mechanism of a gyratory crusher with a suitable schematic diagram. 5
4. A crushing roll having a roll diameter of 1m. is set so that the crushing surface is 12.5mm apart and neep angle $2\alpha = 31°$. What is the maximum feed size to the rolls? 5
5. Explain the motion of the charge in a tumbling mill. 5

COII: (Answer any two questions from CO II)

6. What is the principal classification process? 5
7. Why the cyclones have replaced mechanical classifiers in most of the grinding mills? What are the advantages of using a hydrocyclone classifier? 3+2=5
8. How particle shape and the corrosion of screen materials can affect the screening efficiency? 2.5x2=5

COIII: (Answer any two questions from CO III)

9. Explain the most important features of Wilfley table. What are the advantages offered by the presence of riffles in shaking tables?
   2+3=5
10. What are the different types of products that are avails from the jigging process? What are the general classifications of jigging methods based on arrangements of withdrawing the products? 1+1+3=5
11. How surface chemistry of minerals become very important for froth floatation process? Explain. Name two collectors used in froth flotation process. 4+1=5

COIV: (Answer any two questions from CO IV)

12. What are the important factors influencing the magnetic properties of a material? Explain the mechanism of dry-drum type magnetic separator used in the mineral beneficiation industry. 2+3=5
13. What is the primary purpose of thickening process? How particles can be separated by the thickening process? 2+3=5
14. How pollution can be controlled in mineral beneficiation plant? How water can be removed from the particles? 3+2=5