

**ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2018
EXAMINATION CATEGORY: TECHNICAL**

PAPER III: SUBJECT SPECIALISATION PAPER FOR MINING ENGG.

Date	: 7 October 2018
Total Marks	: 100
Writing Time	: 150 minutes (2.5 hours)
Reading Time	: 15 Minutes (prior to writing time)

GENERAL INSTRUCTIONS:

1. Write your Registration Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is being provided to check the number of pages of Question Paper, printing errors, clarify doubts and to read the instructions. You are NOT permitted to write during this time.
3. This paper consists of **TWO SECTIONS**, namely SECTION A & SECTION B:
 - **SECTION A** has two parts: Part I - 30 Multiple Choice Questions
Part II - 4 Short Answer Questions
All questions under SECTION A are COMPULSORY.
 - **SECTION B** consists of two Case Studies. Choose only **ONE** case study and answer the questions of your choice.
4. All answers should be written on the Answer Booklet provided to you. Candidates are not allowed to write anything on the question paper. If required, ask for additional Answer Booklet.
5. All answers should be written with correct numbering of Section, Part and Question Number in the Answer Booklet provided to you. Note that any answer written without indicating the Section, Part and Question Number will NOT be evaluated and no marks will be awarded.
6. Begin each Section and Part in a fresh page of the Answer Booklet.
7. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
8. Use of any other paper including paper for rough work is not permitted.
9. **You are required to hand over the Answer Booklet to the Invigilator before leaving the examination hall.**
10. This paper has **7 printed pages**, including this instruction page.

GOOD LUCK

SECTION A

PART I: Multiple Choice Questions (30 marks)

Choose the correct answer and write down the letter of your chosen answer in the Answer Booklet against the question number e.g. 31 (d). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

1. Plaster of Paris (PoP) is manufactured from
 - a) Limestone
 - b) Quartzite
 - c) Gypsum
 - d) Dolomite

2. Coal deposit in Bhutan is located in
 - a) South-western Bhutan
 - b) South-eastern Bhutan
 - c) Central Bhutan
 - d) Northern Bhutan

3. The ground vibrations due to blasting operations in mines is measured using
 - a) Altimeter
 - b) Barometer
 - c) Seismograph
 - d) Clinometers

4. Specific gravity of quartzite is
 - a) 2.2
 - b) 2.5
 - c) 2.7
 - d) 2.9

5. The chemical formula of gypsum is
 - a) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
 - b) $\text{CaSO}_4 \cdot 3\text{H}_2\text{O}$
 - c) $\text{CaSO}_4 \cdot 4\text{H}_2\text{O}$
 - d) $\text{CaSO}_4 \cdot \text{H}_2\text{O}$

6. Common example of sedimentary rock is
 - a) Limestone
 - b) Quartzite
 - c) Marble
 - d) Granite

7. Ferro Alloys is manufactured from
 - a) High grade limestone
 - b) High grade quartzite
 - c) High grade dolomite
 - d) Iron Ore

8. Magnesium metal can also be obtained from
 - a) Limestone
 - b) Marble
 - c) Dolomite
 - d) Gneiss

9. What is the major content of quartzite?
 - a) Magnesium
 - b) Alumina
 - c) Silica
 - d) Iron

10. Chicken feeds can also be produced from
 - a) Dolomite
 - b) Hematite
 - c) Quartzite
 - d) Limestone

11. Ferro Alloys is used in
 - a) Steel Industry
 - b) Dolomite Industry
 - c) Cement Industry
 - d) Marble Industry

12. Mineral Development Policy (MDP) is introduced in Bhutan in
 - a) 2015
 - b) 2010
 - c) 2016
 - d) 2017

13. Garland drain in the mines is necessary for which one of the following?
 - a) To increase the production.
 - b) To segregate the minerals from overburden.
 - c) To protect from rainwater entering the mine area during rainy season.
 - d) To protect the mine road from rain water.

14. The stripping ratio is most commonly expressed in
 - a) Tonne of overburden: Tonne of Mineral extracted
 - b) Volume of overburden: Tonne of mineral extracted
 - c) Tonne of Mineral extracted : Volume of overburden
 - d) Volume of overburden: Volume of minerals extracted

15. What type of construction material is required for Hydropower Dam construction?
- Wearing material
 - Hard and compact material
 - Non-wearing material
 - Fine grained
16. The purest form of coal is
- Bituminous
 - Sub-bituminous
 - Anthracite
 - Lignite
17. The use of crimper in blasting is to
- make hole in the explosives.
 - fasten the safety fuse to the detonator.
 - check the cracks in the blast hole.
 - load the explosives to the blast hole.
18. The most appropriate scale on map for preparing mine plan is
- 1:200
 - 1:2000
 - 1: 10000
 - 1: 20000
19. A mining engineer goes for a field visit to carry out pre-feasibility study of a stone deposit (quartzite). He finds out that the deposit has a strike length, thickness of the deposit and down dip extension of 150m, 50m and 30m respectively. What could be the estimated reserve of the quartzite deposit?
- 607500 metric tonnes
 - 650000 metric tonnes
 - 225000 metric tonnes
 - 250000 metric tonnes
20. Gypsum mining in Pemagatshel is operated by
- Druk Mining Private Limited
 - Druk Satair Corporation Limited
 - Jigme Mining Private Limited
 - Bhutan Minerals and Export
21. Application for mining to the department is applied in which form?
- Form A
 - Form B
 - Form C
 - Form D

22. Three mines that that have been auctioned by government are
- Gypsum, Limestone & Coal
 - Coal, Limestone & Quartzite
 - Coal, Gypsum & Dolomite
 - Dolomite, Gypsum & Quartzite
23. The Royalties & Mineral Rent for export of minerals from Bhutan is based on
- Unit based
 - Ad-valorem
 - Export based royalty
 - As proposed by exporter
24. The Department of Geology & Mines (DGM) usually collects funds for restoration of the mine/quarry after the end of lease term. What is the name of the fund?
- Mines Restoration Fund
 - Environment Restoration Bond fund
 - Environment Fund
 - Environment Restoration Fund
25. The softest mineral known in the world is
- Gypsum
 - Coal
 - Talc
 - Dolomite
26. Ordinary Jack Hammer can drill blast hole of
- 30 mm diameter
 - 32 mm diameter
 - 33 mm diameter
 - 37 mm diameter
27. Power gel is
- A Detonator
 - A Safety fuse
 - An Explosive
 - Tertiary Explosives
28. The factor to convert hectares to acres is
- 2.417
 - 2.471
 - 2.174
 - 2.714

29. As per law, what is the maximum number of hours that the individual will be allowed to work in a mine in one day?
- 6 hours
 - 8 hours
 - 10 hours
 - 12 hours
30. What kind of explosives material is used in a detonator?
- ANFO
 - PETN
 - ASA
 - Gun powder

PART II – Short Answer Questions (20 marks)

This part has 4 Short Answer Questions. Answer ALL the questions. Each question carries 5 marks.

1. What are the major reforms that government wants to initiate with the introduction of Mineral Development Policy? (5 marks)
2. Write down your views on Nationalization of Mining Sector. (5 marks)
3. Define Strategic Minerals and give 2 examples in the context of Bhutan. (5 marks)
4. What are the activities required post mining? Why is it important and what are the implications if not carried out properly? (5 marks)

SECTION B

Case Study

Choose either Case I OR Case II from this section. Each case study carries 50 marks.

Case I

Mr. Sonam has applied for a mining license and the Department of Geology & Mines (DGM) has carried out the pre-feasibility study of a stone deposit (quartzite). The study team have found out that the deposit is a cliff with flat top and flat base and is feasible for operation as stone quarry. There is dry depression on either side of the deposit. It has a strike length of 200 meters, dip down extension of 30 meters and the thickness of 40 meters. Overburden encountered during the study is 5 meters. The Promoter wants to operate the mine for 10 years.

1. What are the parameters required to be considered to prepare the project report (Final Mine Feasibility Study) report for the stone quarry? (20 marks)

2. What are the advantages and disadvantages of operating a surface quarry? (10 marks)
3. What would be the tentative geological reserve of the deposit? (5 marks)
4. What could be the tentative overburden that will be generated from the quarry operation?
(5 marks)
5. What kind of machineries and equipment will you suggest to operate the quarry and why?
(5 marks)
6. Where will you suggest to dump the overburden in your mine plan? What would be the necessary mitigation measure required to be taken while you plan for overburden dump yard?
(5 marks)

Case II

A promoter wants to set up a new cement plant at Gelephu.

1. What consideration would the promoter have taken initially to choose the location of the cement factory at Gelephu? (5 marks)
2. What additional studies, formalities and steps that needs to be taken in the initial stage for setting up the project? (10 marks)
3. Apart from cement grade limestone, what other minerals are required for producing cement?
(5 marks)
4. What mitigation measures would you take up to minimize the environmental impact from operating the limestone mines? (10 marks)
5. What is OHS and why is it important in mining as well as in cement plants? (5 marks)
6. What all mitigation measures will you take up while dumping the overburden material in the dump yard? (5 marks)
7. How will you plan for the restoration of the plant and mining area after the project life is over? (10 marks)

TASHI DELEK