

**ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2019
EXAMINATION CATEGORY: TECHNICAL**

PAPER III: SUBJECT SPECIALISATION PAPER FOR MINING

Date	: October 13, 2019
Total Marks	: 100
Writing Time	: 150 minutes (2.5 hours)
Reading Time	: 15 Minutes (prior to writing time)

GENERAL INSTRUCTIONS:

- Write your Registration Number clearly and correctly on the Answer Booklet.
- 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.
- 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.
- 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.
- 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.
- Begin each Section and Part in a fresh page of the Answer Booklet.
- You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
- Use of any other paper including paper for rough work is not permitted.
- You are required to hand over the Answer Booklet to the Invigilator before leaving the examination hall.**
- 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. Which was the first known explosive used in the mining?
 - a) PETN
 - b) Gun Powder
 - c) Powergel
 - d) ANFO

2. Application for Environmental Clearance for mining in Bhutan is made in
 - a) Form A
 - b) Form B
 - c) Form C
 - d) Form J

3. Internal road within the lease area joining all the mine benches is known as
 - a) Access road
 - b) Mine road
 - c) Ramp
 - d) Haulage road

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

5. As per MMMA 1995 and MMR 2002, the maximum allowable ultimate pit slope in soft material is
 - a) 60°
 - b) 70°
 - c) 55°
 - d) 45°

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

7. Which one of the following is present in Gypsum?
 - a) Water
 - b) Iron
 - c) Alumina
 - d) Silica

8. Filament used in the bulb is made of
 - a) Bronze
 - b) Copper
 - c) Tungsten
 - d) Silver

9. What is the major content of limestone?
 - a) CaCO_3
 - b) Al_2O_3
 - c) SiO_2
 - d) CaO

10. The flux used in the furnace of steel production is made from
 - a) Limestone
 - b) Hematite
 - c) Quartzite
 - d) Dolomite

11. Black diamond is usually referred to
 - a) Iron
 - b) Granite
 - c) Coal
 - d) Marble

12. The area between the free face and first row of drill hole is known as
 - a) Spacing
 - b) Strike
 - c) Burden
 - d) Overburden

13. While preparing the mine plan in Bhutan, the contours interval is usually kept at
 - a) 10m
 - b) 7m
 - c) 5m
 - d) 12m

14. From which mineral is the baby powder made of?
 - a) Gypsum
 - b) Limestone
 - c) Quartzite
 - d) Talc

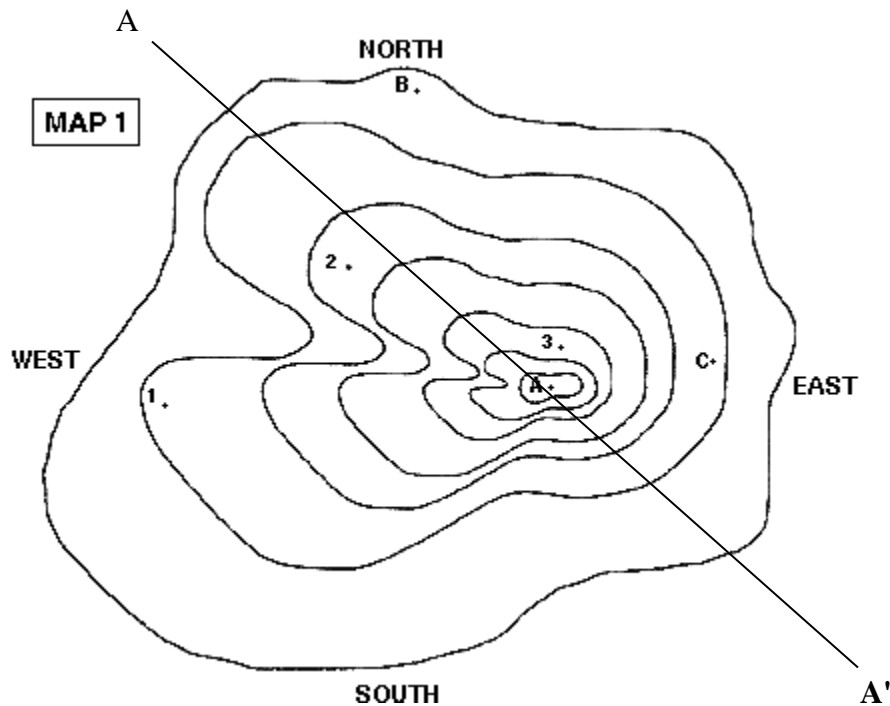
15. Blasting technique used for controlled throw of overburden is known as
- pop shooting
 - cast blasting
 - coyote blasting
 - plaster shooting
16. What is the chemical formula for Gypsum?
- $\text{CaSO}_4 \text{H}_2\text{O}$
 - $\text{CaSO}_3 \cdot 2 \text{H}_2\text{O}$
 - $\text{CaCO}_3 \text{H}_2\text{O}$
 - $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
17. The use of pricker in blasting is to
- make hole in the explosives.
 - to fasten the safety fuse to the detonator.
 - to check the cracks in the blast hole.
 - to load the explosives to the blast hole.
18. The powder factor is defined as
- the amount of explosive required to break 1 m³ or 1 tonne of rock.
 - the amount of rock displaced by 1 kg of explosive.
 - the amount of explosive used in one blast hole.
 - the factor to break the rocks with accordance to hardness.
19. Sub-drilling is the process of
- drilling above the desired floor of blasting in order to form a smooth floor at correct level.
 - drilling below the desired floor in blasting in order to form a smooth floor at correct level.
 - drilling a hole adjacent to the blast hole.
 - None of the above.
20. 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 200m, 50m and 40m respectively. What could be the volume of the quartzite deposit?
- 10,80,000
 - 650000
 - 400,000
 - 250000
21. What are the main raw materials for manufacture of ferro silicon metal?
- Quartzite and coal
 - Quartzite and wood chips
 - Quartzite and dolomite
 - Quartzite and fuel

22. Which agency is the Competent Authority to issue permit for surface collection of construction material in Bhutan?
- Dzongkhags
 - Department of Geology & Mines
 - Department of Forests and Park Services
 - National Environment Commission
23. What is the name of the policy for mining in Bhutan?
- Mining Development Policy 2017
 - Mineral Policy 2017
 - Mining Policy 2017
 - Mineral Development Policy 2017
24. Agricultural use of dolomite is
- soil conditioner.
 - soil sweetener.
 - chemical fertilizer.
 - pesticides.
25. A quarry has 2 million metric tonne of rocks and 2,00,000 m³ of waste/overburden. What would be the stripping ratio of the deposit?
- 1:10
 - 1:6
 - 1:12
 - 1:8
26. What is the second softest mineral known in the world?
- Gypsum
 - Coal
 - Talc
 - Dolomite
27. Air pressure during drilling a blast hole is provided by
- Jack hammer
 - Wagon drill
 - Compressor machine
 - Pump machine
28. Which is not a controlled blasting method?
- Pre-splitting
 - Smooth blasting
 - Cushion blasting
 - Diameter blasting

29. Pril-ammonium nitrate is converted to ammonium nitrate fuel oil (ANFO) by mixing
- Kerosene
 - Petrol
 - Diesel
 - Water
30. Crimper should be made of
- Steel
 - Aluminum
 - Plastic
 - Brass

PART II – Short Answer Questions (20 marks)

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



1. Draw the cross section of A-A' considering inner small circle is at higher elevation. (5 marks)
2. Considering the above map as mine lease boundary, where will you choose to make overburden dump yard? Why? (5 marks)
3. a) In the map above, where is the depression located? (3 marks)
b) Which part of the area in the map is steeper? (2 Marks)
4. Please write down what are the main features of a mine plan (5 marks)

SECTION B: Case Study (50 marks)

Choose either Case I or Case II from this section. Each case study carries 50 marks. Mark for each sub-question is indicated in the brackets.

Case I

Penden Cement Authority has 1 year for the expiry of their Pugli Limestone Mine which has an area of 10. Department of Geology & Mines (DGM) have asked the company to submit Mine Reclamation and Restoration Plan 1 year prior to expiry of the lease period.

1. If you are the consulting Mining Engineer of the Company, how will you prepare the Mine Restoration/Reclamation Plan? Include the budget allocation layout too in the report. (20 marks)
2. What factors do you have to consider before preparing the plan? (10 marks)
3. What is progressive restoration? (5 marks)
4. What is the use of collecting Environmental Restoration Bond (ERB) fund from the Mining Companies? (5 marks)
5. If you are intending to plant trees in the area, what type of tree plants will you propose? Why? (5 marks)
6. Apart from the Department of Geology & Mines, which other agency will you approach while carrying out the reclamation and restoration work? Why? (5 marks)

Case II

A promoter proposes to win/excavate 2000 MT of construction material a day. He has 2 active mine benches in operation of 100m length and 5 meters width each.

1. Estimate the number of drill holes he will require to produce 2000MT of construction material. Justify your estimation. (5 marks)
2. Estimate the length of each drill holes to produce 2000 MT of materials. (5 marks)
3. What are the accessories required for blasting? Write the uses of each accessories. (10 marks)
4. Write down at least two ways as how you can reduce ground vibration. (5 marks)
5. What is misfire in blasting? How will you identify and treat misfire? (10 marks)
6. Explain how the explosives should be stored in a magazine? (5 marks)
7. Write down 5 properties of explosives. (5 marks)
8. Write down various method of igniting the explosives. (5 marks)

TASHI DELEK