

ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2023
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALISATION PAPER FOR MINING

Date	: October 7, 2022
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 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 on 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 must 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. Quartzite is an example of
 - a) Rock
 - b) Mineral
 - c) Ore
 - d) Slag

2. Which of the following is NOT a stake holder of mining?
 - a) Department of Geology and Mines
 - b) Department of Environment & Climate Change
 - c) Department of Forest and Park Services
 - d) Department of Energy

3. A FMFS report is a document containing
 - a) in reasonable detail, the technical, financial, environmental and social impact analyses required prior to the approval of a mining lease.
 - b) an EIA report including all scoping and baseline studies
 - c) mine plan but no environmental management plan
 - d) a detail of geological report

4. Which one of the following is softest mineral?
 - a) Gypsum
 - b) Graphite
 - c) Talc
 - d) Dolomite

5. The amount of measurement of the gradient of a slope is
 - a) A vertical angle.
 - b) A horizontal angle.
 - c) *Both vertical and horizontal angles.*
 - d) None of the above

6. If the gradient of a section of a mine access road is 1:12, the gradient of the road in percentage is
 - a) 7.33%
 - b) 8.33%
 - c) 9.33%
 - d) 10.33%

7. A surveyed mine area was first mapped at the scale of 1: 1000 and then secondly at the scale of 1: 2000. How will the second map be compared to the first one?
 - a) Bigger
 - b) Smaller
 - c) Same
 - d) None of the above

8. A map is drawn with a scale of 1 centimeter = 2 kilometers. How many kilometers does 5 centimeters represent?
- 0.4 km
 - 2.5 km
 - 5 km
 - 10 km
9. A topographic map
- uses contour lines to show the shape and elevation of the land.
 - is a type of globe with bumps showing the shape of the land.
 - shows the depths of the oceans.
 - uses contour lines to show latitude and longitude.
10. Following are the processes involved in the extraction of rock/mineral **EXCEPT**
- The removal of OB
 - The rock extraction
 - Irrigation
 - Site restoration
11. As per the provisions of the MMR 2002, under '*Environmental restoration bond*' the lessee shall deposit an environmental bond to the Government as security for
- carrying out the mining/quarrying operations not as per the approved FMFS report and other relevant rules & regulations set up by the government.
 - mine reclamation and environmental restoration in the mine and for ensuring that the negative impacts on the surrounding environment are minimized.*
 - claiming the interest given on the security bond by the government for increasing the mining activities in the country.
 - taking out loans from the financial institutions to carry out the mining/quarrying operations in the Country.
12. The minimum distance between magazine and public dwellings should be:
- 500 metres
 - 700 metres
 - 200 metres
 - 100 metres
13. Ad valorem royalty is levied for the export of minerals on:
- the MFP or the invoice value whichever is higher.
 - the MFP or the invoice value whichever is lower.
 - the MRF or the invoice value whichever is higher.
 - the MRF or the invoice value whichever is lower.
14. Explosives inside Detonator
- ASA and Gun powder
 - PETEN and Gunpowder
 - ASA and PETN
 - Gunpowder and ANFO

15. Which of the following stripping ratio (ore to waste) is best for miming/quarrying project?
- a) 1:5
 - b) 1:11
 - c) 1: 2
 - d) 1: 0.5
16. Ad valorem royalty for export of minerals is levied at
- a) mine exit point.
 - b) country exit point.
 - c) the destination.
 - d) the weighbridge.
17. Long wall method is generally employed for
- a) Copper ore mining
 - b) Iron ore mining
 - c) Coal mining
 - d) Gypsum mining
18. Grab sampling consists in
- a) picking pieces of ore at one place only.
 - b) picking pieces of ore at random to make up a sample.
 - c) picking pieces of coal only.
 - d) picking pieces of ore in a grid fashion.
19. The rate at which detonation wave passes through the column of explosives is known as:
- a) Strength of detonation
 - b) velocity of detonation
 - c) density of explosives
 - d) stability of explosives
20. The mining terminology, exploitation or winning is
- a) the process of blasting.
 - b) the process of extracting the ore or economic mineral from the earth.
 - c) the process of ventilation.
 - d) the detailed mapping of the ore body.
21. Minimum metal percentage, at which mining is profitable, is known as
- a) Average grade
 - b) Cut-off grade
 - c) Mill grade
 - d) Economical grade
22. Ultimate Pit slope is the angle made by the imaginary line joining the
- a) average of the all bench angles.
 - b) top most crest of the bench to bottom most toe of the bench.
 - c) top most toe of the bench to the bottom most toe of the bench.
 - d) top most crest of the bench to bottom most crest of the bench.

23. Coal formation takes place in which of the following order?
- Peat- lignite – anthracite – bituminous
 - Peat – lignite – bituminous – anthracite
 - Bituminous – peat – lignite – anthracite
 - Lignite – peat – bituminous – anthracite
24. As per the MMR 2022, the maximum permissible noise level on the site shall be
- 120 dBA for an 8 hour shift.
 - 180 dBA for an 8 hour shift.
 - 90 dBA for an 8 hour shift.
 - 80 dBA for an 8 hour shift.
25. A building, where explosives and detonators are stored, is called
- Shelter
 - Magazine
 - Store
 - House
26. Contours in a topographic map
- lines joining the point of same elevations.
 - shows the level of depth of mine.
 - used for calculating the area.
 - None of the above
27. **PPE** for miner includes
- Helmet and safety shoes
 - Pen and diary
 - Safety booklet
 - Hand plan of a mine
28. Factor of safety for stability of benches depends on the
- Height of the bench
 - Slope angle
 - Strength of the rock
 - All of the above
29. Which of the following factor is considered for calculation of cycle time of excavating machine?
- Swell Factor
 - Bucket factor
 - Swing Factor
 - Drill factor
30. Which of the following statement is **INCORRECT**?
- Controlled blasting is done to avoid fly rock
 - Secondary blasting is done for big size boulders
 - Secondary blasting is done to avoid the toe formation
 - Stemming is required to avoid the blown out shots

PART II – Short Answer Questions [20 marks]

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

1. What do you mean by Conversion Factor (CF)? How do you think conversion factor is important? Calculate the domestic royalty for limestone, given the details as follows:
 - a) Volume: 460 cubic ft.
 - b) Royalty and mineral rent: Nu. 34 and Nu. 8.5/MT respectively
 - c) CF: 25
2. Why it is necessary to carry out Break Even Analysis in a mining business? What is a break-even point?
3. What are the two legislations that govern and regulate the mining operation in Bhutan? Describe the role of mining industry in the economic development of a country.
4. Explain the Environment Restoration Bond Formula and its mode of payment.
5. Why is EIA important to be carried out for projects? What are the major components of assessment required in EIA study? What is ToR and who endorses it for mining projects? Explain the need to carry out Social Impact Assessment during the EIA process.

SECTION B: Case Study [50 marks]

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

CASE I

1. A mine bench measures 5m width, 5m height, 100m length and 60° bench slope angle. The bench has 2m thick OB. If the whole bench is removed, what would be the amount of the OB and the mineral excavated, in metric tonne? Also calculate the stripping ratio of the bench. **(10 marks)**
2. With a neat diagram, explain the open pit mining sequence for a pipe like ore body. What is the effect of haul road gradient, bench and overall pit slope angle on the stripping ratio? How does stripping ratio and cut-off grade determine the ultimate pit limits? Why is it important to manage overburden in a mine? **(10 marks)**
3. When an accident takes place in a mine area, what is lessee or the mines manager supposed to do to the department? **(10 marks)**
4. What do you mean by conservation of minerals? Explain the context of mineral conservations in Bhutanese mining industry in context to value addition policy. **(10 marks)**
5. What are the two mineral royalty system of Bhutan? Elaborate on the process of levying the Domestic and Export Mineral Royalty system of Bhutan. List down the advantage and disadvantage of having mix mode of royalty system in the country. **(10 marks)**

CASE II

1. State the provisions of Corporate Social Responsibilities (CSR) in line with the MMR 2022. **(10 marks)**
2. What is mine planning? Explain mine planning and its components. Explain the difference between Geological reserve and Mineable reserve. **(10 marks)**
3. How will you apply basic management strategy in mine management? What are the features of mine management system? **(10 marks)**
4. Briefly describe various operations involved in Surface Mining. Give classification of Surface mining method in relation to equipment used. **(10 marks)**
5. Define misfire its identification and treatment. Explain two techniques for control blasting? Write down at least four ways how you can reduce ground vibration during blasting operation **(10 marks)**

TASHI DELEK