

**ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2021
EXAMINATION CATEGORY: TECHNICAL**

PAPER III: SUBJECT SPECIALISATION PAPER FOR MINING

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| Date | : October 31, 2021 |
| 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 **8 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. The lessee shall submit Mine Restoration Plan to the Department _____ prior to the expiry of lease for review and approval.
 - a) two and half years
 - b) two years
 - c) one and half years
 - d) one years

2. IEE form is applicable for proposed quarries measuring less than or equal to _____ acres and maximum operation of _____ years outside the protected area.
 - a) ten, ten
 - b) ten, five
 - c) five, five
 - d) five, ten

3. The Environmental Restoration Bond (ERB) is collected as the security for the mine restoration. The total ERB payable is calculated using the Formula $Ax + By + Cz$. The A component of the formula is
 - a) Area in hectare
 - b) Area in acres
 - c) Overburden in cubic meter
 - d) Overburden in metric tonnes

4. The Technical Committee of the Department evaluates the performance of the mine's restoration works in line with section 73.1 of MMR 2002. The total score of the technical committee shall be converted for use in Final Performance Evaluation in Form L (iii) of Annex 1 of MMR 2002. What is the weightage of mine restoration in Final Performance Evaluation in Form L (iii)?
 - a) 15%
 - b) 20%
 - c) 30%
 - d) 10%

5. The application for the renewal of Environmental Clearance shall be submitted to the Secretariat or the concerned Competent Authority at least _____ before the expiry date of the Environmental Clearance.
 - a) 3 months
 - b) 6 months
 - c) 8 months
 - d) 4 months

6. The minimum distance between magazine and public dwellings should be
 - a) 100 meters
 - b) 200 meters
 - c) 400 meters
 - d) 500 meters

7. Pril-ammonium nitrate is converted to ammonium nitrate fuel oil by mixing
 - a) Petrol
 - b) Kerosene
 - c) High Speed Diesel
 - d) Hot water

8. Cap sensitive means an explosive which
 - a) explodes on initiation by a detonator of minimum strength.
 - b) burns on initiation by a detonator.
 - c) melts on initiation by the ordinary detonator.
 - d) is non-sensitive to ordinary detonator.

9. Where should the mother magazine kept?
 - a) Magazine on the roof top
 - b) Magazine under the ground
 - c) Magazine under a dark room
 - d) Magazine on an open ground

10. A certified “Blaster” means a person
 - a) who works as helper in the mines and quarries.
 - b) who is the holder of a valid license to carry out blasting.
 - c) certified by MoHCA to carry out blasting.
 - d) person who is kept to guard the explosives and magazines.

11. All of the following are the mineral ore found in Bhutan EXCEPT
 - a) Iron
 - b) Tungsten
 - c) Gold
 - d) Aluminium

12. Which one of the following minerals is used in paper industry?
 - a) Dolomite
 - b) Gypsum
 - c) Talc
 - d) Quartzite

13. Ferro-silicon metal is produced from which one of the following minerals?
 - a) Limestone
 - b) Dolomite
 - c) Granite
 - d) Quartzite

14. What is “an angle of repose”?
- The *angle of repose* is the angle made by a material, with respect to the horizontal when piled.
 - The *angle of repose* is the angle made by a material, with respect to the vertical when piled.
 - The *angle of repose* is the angle made by a material, with respect to the horizontal when piled.
 - The *angle of repose* is the angle made by a material, with respect to the slope of the area when piled.
15. Drift mining is generally done
- for the underground mining.
 - in coal mining.
 - for placer deposits.
 - in exploitation of thin mineral ore.
16. Long wall method is
- generally applicable to thin coal seams.
 - applied to deep mining.
 - applicable to thick coal seams.
 - applied to very deep mining and thick coal seams.
17. Strip mining is a method of
- underground mining.
 - opencast mining with a high degree of mechanization.
 - horizon mining.
 - long wall mining.
18. Minimum metal percentage, at which mining is profitable, is known as
- Average grade
 - Cut-off grade
 - Mill grade
 - Economical grade
19. The mining terminology, exploitation or winning is
- the process of blasting.
 - the process of extracting the ore or economic mineral from the earth.
 - the process of ventilation.
 - the detailed mapping of the ore body.
20. Grab sampling consists in
- picking pieces of ore at one place only.
 - picking pieces of ore at random to make up a sample.
 - picking pieces of coal only.
 - picking pieces of ore in a grid fashion.

21. What is the standard contour interval kept to prepare a mine plan in Bhutan?
- 2 meters
 - 10 meters
 - 5 meters
 - 4 meters
22. The factor to convert acres to hectares and vice versa is
- 2.451
 - 2.471
 - 2.741
 - 2.175
23. What is the use of ERB fund?
- Fund to procure mine machineries
 - Fund to dump the overburden material
 - Fund to procure plants and saplings
 - Fund to restore and reclaim mined out areas
24. The main reports required for leasing a mine are the following
- FMFS, EIA and EMP report
 - FMFS, SEA and EIA report
 - PFS, FMFS and EIA report
 - FMFS, EIA and IEE report
25. If a Promoter operate a mine with _____ years from the date of signing the Lease Agreement, the lease of the mine will automatically lapse.
- 1 year
 - 2 years
 - 3 years
 - 4 years
26. Who has the authority to amend and approve the Mines and Mineral Management Regulation?
- The Director General of the Department
 - The Cabinet
 - The National Assembly
 - The Minister of the Ministry
27. According to the MMMR 2002, a person shall not enter the area of blasting after misfire has occurred due to safety fuse blasting within _____ after the shot has been fired.
- 10 minutes
 - 20 minutes
 - 30 minutes
 - 60 minutes
28. What is Burden?
- It is the distance between the first row of the blasting and the face of the bench.
 - It is distance between the last row of the blasting and end of the bench.
 - It is distance between the two blast holes.
 - It is the distance between the two subsequent benches.

29. Coal seam are usually found in
- Igneous rocks
 - Metamorphic rock
 - Sedimentary rocks
 - Fossil rocks
30. No person employed in a mine shall work for more than _____ continuously before he has had a rest interval of at least half an hour.
- 3 hours
 - 4 hours
 - 5 hours
 - 8 hours

PART II – Short Answer Questions [20 marks]

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

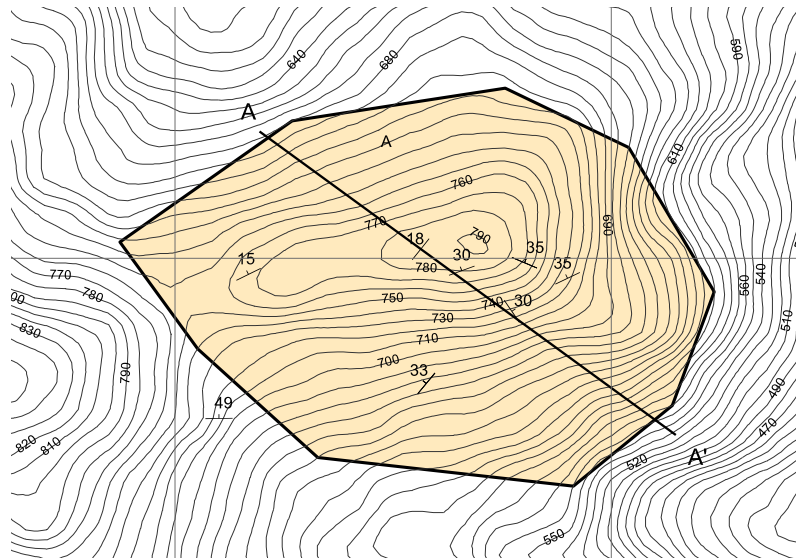
- List down and explain various properties of explosives.
- What are various instrument and apparatus used while blasting a blast hole? Write down the use of each instrument.
- What are the basic rock classification? How are they formed? Give one example of each.
- What is misfire shot? How is it treated in case of both fuse blasting and electrical or detonating cord blasting?

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

You are a Mining Engineer at the Department of Geology & Mines. You are asked by your supervisor to go to a proposed stone quarry site and carry out pre-feasibility study and prepare a report. Given below is the tentative demarcation of the proposed site with contour lines.



1. What are the factors that you will consider while carrying out the pre-feasibility study? Please describe each. (10 marks)
2. Describe the type of land formation from the above drawing. (2 marks)
3. Please draw a cross-section of A-A'. (5 marks)
4. Where will you choose the site to dump the overburden? Give reason (5 marks)
5. Identify some of the environmental impact that are likely to take place because of the quarry operation and mention some of the mitigation methods. (10 marks)
6. Which agencies are responsible to demarcate the quarry boundary? (3 marks)
7. What basic instrument you should carry with you while carrying out Pre-feasibility Study? (5 marks)
8. What are the different ways of leasing a mine/quarry in Bhutan? (5 marks).
9. What are the different processes involved while leasing a mine or quarries? Please list down the processes in sequence. (5 marks)

CASE II

You are a Mining Engineer working for a private mining company in Bhutan. You are given a responsibility to design and develop a new mine. The mine is leased for 10 years with stripping ratio of 0.10: 1.0 (OB: Mineral). The mine is situated on a hill having a slope of 60° with flat top and base. The mine area is 30 acres. There is a small stream located at distance of 300 meters from the mine. The production target of the Company is 100,000 MT per year.

1. What type of mining method will you propose for the operation of the mine? Why? (5 marks)
2. What bench height and width you will propose for the operation of the mine? Give reason. (5 marks)
3. What are various activity you need to carry before you actually start excavation of the material/mineral? (5 marks)
4. During monsoon, there are chances of mine runoff water going into the stream. What precautionary method you will develop in order to avoid the muddy water going into the stream? (5 marks)
5. What type of explosives and what method of initiation will you propose to excavate the given amount of production target? (5 marks)
6. What Occupational Health and Safety (OHS) method will you adopt for the workers working in the mine? (5 marks)
7. How many metric tons of material/mineral you need to excavate on daily basis? Show the rough calculation. (5 marks)
8. What precautionary method will you develop for the overburden dump yard? (5 marks)
9. What are the different types of waste that you expect will be generated from the mine operation? How will you dispose it? (5 marks)
10. Please estimate the quantity of water required in liters for different activities in mine operation. (5 marks)

TASHI DELEK