

**ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2020
EXAMINATION CATEGORY: TECHNICAL**

PAPER III: SUBJECT SPECIALISATION PAPER FOR FORESTRY

Date	: February 27, 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 the 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 any or correct Section, Part and Question Number will NOT be evaluated and no marks would 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 natural or artificial restocking of an area with forest is termed as
 - a) Afforestation
 - b) Reforestation
 - c) Plantation
 - d) All of the above

2. The development of roots on a stem while it is still attached to the parent plant is termed as
 - a) Layering
 - b) Root cuttings
 - c) Grafting
 - d) None of the above

3. The process of treatment given to seedlings still in the nursery, by gradually exposing to the adverse conditions in the field is termed as
 - a) Fertilization
 - b) Mulching
 - c) Hardening off
 - d) Root pruning

4. Any disease that results in rapid decay or death of young succulent seedlings of both coniferous and broad-leaved species due to high humidity, moist soil, high organic matter and shade is termed as
 - a) Damping-off
 - b) Die-back
 - c) Needle blight
 - d) Leaf Spot

5. The shifting cultivation is locally termed “Tseri or Pangshing” is an area left fallowed or allowed to revert back to forest in order to rejuvenate the site.
 - a) True
 - b) False

6. The second National Forest Inventory was carried out from 2012-2015 after Pre-Investment Survey (PIS) conducted from 1974 to 1981. The purpose of the second National Forest Inventory was to
 - a) calculate the total forest biomass and carbon stocks.
 - b) understand the regeneration dynamics and species diversity.
 - c) forest increment status and forest health.
 - d) All of the above.

7. It is important to measure the diameter of tree during the forest inventory mainly to
 - a) understand the population structure of the forest community.
 - b) study regeneration dynamics of the forest.
 - c) calculate the species diversity of a forest community.
 - d) All of the above.

8. Biological corridors (BCs) in Bhutan were established in 1999 and bestowed as a gift to the earth from Bhutan. BCs serves as
 - a) reliable passage for wide ranging wildlife species.
 - b) allow species to adapt to climate change.
 - c) promote gene flow for all species.
 - d) All of the above.

9. What do pollen grains contain?
 - a) Male gametophyte
 - b) Female gametophyte
 - c) Male sporophyte
 - d) Sperm

10. The first Community Forest in Bhutan was established at Dozam, Trashigang in 1997 managed by the Community Forest Management Group (CFMG) for its Management. Today after more than two decades of its first establishment, the total number of Community Forest in Bhutan reached to
 - a) 809 CFs
 - b) 530 CFs
 - c) 822 CFs
 - d) 745 CFs

11. A land-use technology that combines trees with arable crops and/or livestock on a single management unit with the overall goal of higher sustainable productivity is termed as Agroforestry. This technology is one of the alternatives to which of the following traditional practice?
 - a) Shifting cultivation (Tseri)
 - b) Slash-and-burn agriculture
 - c) Swidden Agriculture
 - d) All of the above

12. The contrasting climatic conditions brought about by high altitudinal range from the Southern foothills to the Northern High Mountains contributed to Bhutan's diverse forest ecosystems. Which one of the following forest types is not found in Bhutan?
 - a) Dry Tropical Forest
 - b) Warm broad-leaved forest
 - c) Cool broad-leaved forest
 - d) Cool conifer forest

13. The global trend of increasing temperature is a serious concern for Bhutan considering the rapid retreat of glaciers in the Himalayas. In the long run, this phenomenon will result in the reduction of river flow. One of the mitigation measures to sustain river flows in Bhutan is by
- planting in the natural barren areas.
 - building of reservoirs.
 - identifying and managing the critical forest watersheds.
 - cutting trees to reduce transpiration.
14. 'The art and science of controlling the establishment, growth, composition, health and quality of forests and woodlands to meet the targeted diverse needs and values of landowners and society on a sustainable basis as defined by IUFRO, 2000 is
- Agroforestry
 - Floriculture
 - Sericulture
 - Silviculture
15. An aggregation of trees or other growth occupying a specific area and sufficiently uniform in species composition, size, age, arrangement, and condition as to be distinguished from the forest or other growth on adjoining areas is
- Stand
 - Forest
 - Ecosystem
 - Community
16. The Silvicultural practice applied in the sub-tropical and broad-leaved forest of Bhutan is mainly
- Single tree selection
 - Group selection
 - Strip clearcut felling system
 - Patch felling with natural or artificial regeneration
17. Mixed conifer forest of Bhutan is defined by the species compositions of
- Abies densa, Larix griffithii, Juniper recurva.*
 - Picea spinulosa, Juniper recurva, Pinus roxburghii, Abiesdensa.*
 - Tsuga dumosa, Juniper recurva, Larix griffithii, Taxus baccata.*
 - Tsuga dumosa, Picea spinulosa, Larix griffithii.*
18. His Majesty The Fourth Druk Gyalpo Jigme Singye Wangchuck received several conservation awards. The Award, His Majesty The Fourth Druk Gyalpo received in the year 2006 was
- UNEP Champions of the Earth
 - John Paul Getty Conservation Leadership Award
 - Kyoto Hall of Fame
 - All of the above

19. If most individuals in a population are young, the population is likely to grow rapidly in the future because
- many individuals will begin to reproduce soon.
 - population has a skewed age distribution.
 - immigration and emigration can be ignored.
 - death rates will be low.
20. Which one of the following donor agencies can only fund the conservation and livelihood activities related to the protected areas of Bhutan?
- Royal Society for Protection of Nature
 - Bhutan Foundation
 - Bhutan Trust Fund for Environmental Conservation,
 - Bhutan For Life
21. The most preferred and available timber species in the mid-altitudes of Bhutan are
- Tsuga dumosa*, *Pinus wallichiana*, *Picea spinulosa*.
 - Abies densa*, *Larxi griffithii*, *Pinus bhutanica*.
 - Pinus wallichiana*, *Pinus roxburghii*, *Pinus bhutanica*.
 - All of the above.
22. Which of the following disturbances is frequently responsible for preventing trees from establishing in grasslands?
- Volcanoes
 - Windstorms
 - Fire
 - Glaciation
23. The first Forestry School in Bhutan was established in 1971 at
- Taba, Thimphu
 - Yusipang, Thimphu
 - Lamai Gonpa, Bumthang
 - Kalikhola, Southern Bhutan
24. Introduction of exotic tree species in Bhutan is strictly monitored. Which one of the following trees is introduced and now naturalized in Bhutan?
- Pinus excelsa*
 - Tectona grandis*
 - Cryptomeria japonica*
 - Shorea robusta*
25. The Department of Forest was the first Department established in Bhutan in the year 1952. The Department of Forest was also the first Department to enact the Forest Act of Bhutan in the year
- 1957
 - 1963
 - 1966
 - 1969

26. Which of the following is NOT one of the four components of ecosystems?
- Primary producers
 - The abiotic environment
 - Decomposers
 - Secondary carnivores
27. Department of Forest and Park Services implemented REDD+ readiness project. What do you understand by REDD +?
- Reducing emissions from deforestation and forest degradation.
 - Reducing environmental impact from deforestation and forest degradation.
 - Reduction of emission from forest degradation and deforestation for clean environment.
 - All of the above.
28. Green Bhutan Corporation Limited (GBCL) is the first state-owned enterprise (SoE) established with the vision in developing clean and green landscape with climate smart interventions contributing to healthier environment and socio-economic development. One of their mandates is to undertake afforestation. What do you understand by afforestation?
- Plantation in the natural barren/open area
 - Plantation in the logged area
 - Enrichment plantation
 - Urban plantation
29. The Convention on Wetlands, known as the Ramsar Convention, is an intergovernmental environmental treaty established in 1971 by UNESCO, which came into force in 1975. Bhutan Declared three (3) RAMSAR sites. The first two Ramsar site in Bhutan are
- Bumdeling in Trashiyangtse and Khotokha in Wangdue
 - Gangtey-Phobji and Khotokha
 - Gantey-Phobji and Bumdeling
 - None of the above
30. What is the only evolutionary mechanism that leads to adaptation?
- Selection
 - Genetic drift
 - Migration
 - Mutation

PART II – Short Answer Questions [20 marks]

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

1. The forest cover of Bhutan stands at about 72% of the total land area. What do you understand by forest and forest cover?
2. Bhutan has abundant fresh water resources with per capita availability of about 94,000 cubic meters per annum. Yet, many agricultural fields remain uncultivated due to lack of water for irrigation. What technical interventions are required to mitigate these issues?
3. What are the major forest pest and diseases in Bhutan?
4. Define the following terms:
 - a) Flagship species
 - b) Keystone species

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: Importance of managing the wetland of International and National importance.

Wetlands are the ecotone/transitional landscapes between terrestrial and aquatic ecosystems. They exhibit both the characteristics of terrestrial as well as aquatic ecosystem. Wetlands in Bhutan can be classified into three types; (1) High altitude wetland above 3000 m a.s.l. which serves as main water source for clean perennial water, (2) Mid-altitude wetlands between 2000-29000 m a.s.l. which serves as an important winter habitat and roosting sites for various winter bird species and as a reservoirs for the downstream communities and (3) low altitude wetlands below 1000 m a.s.l. serves as an important water sources for variety of life forms and downstream communities.

These wetlands play an important role as a habitat for several species including critically endangered White-bellied Heron and a globally listed vulnerable Black Necked Cranes. Black Necked Cranes are culturally significant and forms the integral part of the landscape's biophysical ecosystems.

Besides wetlands provide various environmental functions and services to other live forms and are considered the most productive ecosystem on the planet. However, these wetlands are under severe threats.

1. What are the potential threats to the wetlands of Bhutan? How can we mitigate such threats?
(15 marks)
2. Why some of the wetland in Bhutan are declared as wetland of international Importance? How is it different from the wetland of National Importance? (15 marks)

3. How are these wetlands recharged naturally? Can the surrounding land use practices influence the wetland management? (10 marks)
4. Name three wetland of International Importance (Ramsar sites). Can local communities benefit by declaring the wetland as a wetland of international importance and how? (10 marks)

CASE II: Forest Resources Potential of Bhutan

The Forest Resources Potential Assessment was carried out by the Forest Resources Management Divisions of the Department of Forest and Park Services in 2013 to understand the potential production capacity of forest. The assessment was carried using spatial multi-criteria analysis at two different levels taking terrain into consideration (i.e. slope $\leq 45^\circ$ and $\leq 35^\circ$). This is because the potential production forest areas $\leq 35^\circ$ can be easily brought under sustainable forest management while potential production forest areas $\leq 45^\circ$ can be also brought under sustainable forest management but with certain management prescriptions. According to the analysis, **27.92%** of the country's geographical area is potential for sustainable forest management having slope $\leq 45^\circ$. When considering slope $\leq 35^\circ$, only **23.25%** of the country's geographical area is potential for sustainable forest management. Further, the economic analysis shows that **11.27%** of the total geographical area which is equivalent to **16%** of the total forest has potential for sustainable forest management. Out of the total, only around **5.8%** of the total geographical area can be sustainably managed for commercial purpose. The remaining **5.4%** of the total geographical area can be sustainably managed for rural supply and may be subjected to commercial management with improved technology.

1. Considering the above information, what are the potential threats if Bhutan goes for large scale logging to offset economic loss brought about by CoVID-19 pandemic? (20 marks)
2. Given the limited available forest area for timber extraction, how can the concern agencies meet the local demand and for export? (10 marks)
3. Can Bhutan benefit by having large area under forest cover? What are the likely impacts on the local communities? (10 marks)
4. Which type of forest is potential for intensive logging in the country and why? (10 marks)

TASHI DELEK