

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

**PAPER III: SUBJECT SPECIALISATION PAPER FOR FORESTRY**

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

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**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 any or correct Section, Part and Question Number will NOT be evaluated and no marks would 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 **10 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 interaction between individuals of the same species or different species at the same trophic level, in which the growth and survival of one or all species or individuals is adversely affected:
  - a) Compensation point
  - b) Competitive exclusion principle
  - c) Competitive release
  - d) None of the above
  
2. A directional movement of a plant in response to the stimulus of gravity is
  - a) Phototropism
  - b) Diageotropism
  - c) Hydrotropism
  - d) Geotropism
  
3. The protected area constituted of 51.44% of the total land area of Bhutan. The protected area includes which forest management regimes:
  - a) National Parks, wildlife Sanctuaries, Botanical Parks, Community forests, Strict Nature Reserves.
  - b) National Parks, Biological Corridors, Strict Nature Reserves, Heritage Forests, Wildlife Sanctuaries.
  - c) National Parks, Wildlife Sanctuaries, Strict Nature Reserves, Biological Corridors.
  - d) National Parks, Ramsar Sites, Biological Corridors, Wildlife Sanctuaries, Strict Nature Reserves.
  
4. Owing to Bhutan's wide altitudinal range from about 100 m a.s.l. in the South to over 7000 m a.s.l. in the North, Bhutan has various forest types. However, which one of the following forest types is not found in the Bhutan Himalaya?
  - a) Sub-tropical deciduous forest
  - b) Evergreen broad-leaved forest
  - c) Conifer forest
  - d) Mixed conifer forest
  
5. Why do we measure the diameter of a tree (DBH at 1.3 m) while carrying out forest inventory in the field?
  - a) Understand forest dominance
  - b) Calculate total basal area
  - c) Understand forest diversity
  - d) All of the above.

6. Forest Management Units (FMUs) are identified and established with the written management plans. All the plans are prepared in line with the provisions under the “Forest Management Code of Bhutan”. Who is responsible for logging operations in the FMUs?
- Logging operations are carried out by private companies in the FMUs.
  - Logging operations are carried out by the Forestry Officials of the Department of Forest and Park Services.
  - Logging operations are carried out by the local communities.
  - None of the above.
7. Once the forest areas have been designated as protected areas, which management regimes are not applicable?
- Community Forests, Private Forest, Heritage Forest.
  - Private Forests, Heritage Forest, Wetland.
  - Heritage Forest, Community Forest, Ramsar site.
  - Forest Management Units, Sustainable Commercial logging.
8. Which silviculture system is currently applied in the field of logging in Bhutan?
- Single tree selection, group selection, clear fell.
  - Strip logging, single tree selection, group selection.
  - Clear fell, single tree selection, coop system.
  - None of the above.
9. Royal Society for Protection of Nature (RSPN) is working closely with the Department of Forest and Park Services in the field of nature conservation. The two iconic species that the RSPN focuses are
- Rufous Hornbill and Black Necked Crane
  - Black Necked Crane and White Bellied Heron
  - White Bellied Heron and Himalayan Monal
  - Raven and White Bellied Heron
10. The theme of the International day of forest in 2019 is “Forest and Education”. The International Day of Forest is celebrated around the world every year on
- September 21
  - February 21
  - April 21
  - March 21
11. Bhutan celebrated the World Ranger Day for the first time on \_\_\_\_\_ as a tribute to recognize the role that the rangers play in the conservation of Bhutan’s natural heritage and public service delivery.
- July 31, 2018
  - July 31, 2017
  - August 1, 2017
  - July 31, 2019

12. The fourth pilot scheme of payment for environmental services (PES) was established recently in the country in which Dzongkhag?
- Tsirang Dzongkhag
  - Paro Dzongkhag
  - Mongar Dzongkhag
  - Chukha Dzongkhag
13. Community forest is gaining popularity in sustainable management of the forest resources at the community level. There are over 800 Community Forests established in the country. The Community Forests are established with the objective of
- meeting the timber and NWFP demand of the local communities.
  - transferring the ownership of managing the resources to the communities.
  - sustainably manage and utilize the limited resources.
  - All of the above.
14. The unpredictable local climatic fluctuations lead to series of issues such as forest fire, drought, floods etc. What are some of the measures Bhutan has taken to mitigate these issues?
- Mobilize resources to fight forest fire.
  - Protection of river embankment to reduce flood.
  - Plantation of tree seedlings in the barren areas.
  - Protect and manage the forest ecosystems.
15. Temperate forests are found in which of the following climate types?
- Mid-altitude of cold and humid
  - Subtropical dry
  - Mid-latitude steppe
  - Wet tropical
16. Which of the following is not correlated with species diversity?
- Resilience
  - Latitude
  - Productivity
  - Longitude
17. Forest fragmentation is one of the major issues in the forest ecosystem management. What happens when the forested area are fragmented?
- Diversity of the forest ecosystem increase.
  - Forest productivity increased.
  - Invasive species will be controlled.
  - None of the above.
18. An evolutionary relationship within and between taxonomic levels refers to
- Genetic study
  - Phylogeny
  - Paleontology
  - All of the above.

19. Which is the only evolutionary mechanism that leads to adaptation?
- Migration
  - Genetic change
  - Immigration
  - Selection
20. Flowering plants produce seeds. What do seeds contain?
- Pollen grains and stigma.
  - Male gametophyte and nutritive tissues.
  - Mature sporophyte and nutritive tissues.
  - Embryo and nutritive tissues.
21. The total forest coverage of Bhutan is 72% and committed to remain Carbon Neutral. What do you understand by Carbon Neutral?
- Ban on vehicle import.
  - Use electric vehicle.
  - To achieve zero carbon foot print.
  - All of the above.
22. Bhutan is a mountainous country with barely 2% flat land. Different forest types and life forms exist due to huge difference in altitudinal range. The instruments that measures exact elevation of an area is
- Barometer
  - Hypsometer
  - Digital compass
  - Altimeter
23. Bhutan being located in the Himalayas receives monsoon. The onset of monsoon coincides with the transplanted of paddy in the agricultural fields. The arrival of monsoon indicates the end of forest fire. When does monsoon begin?
- End of May
  - End of June
  - Start of July
  - Mid June
24. The rainfall in monsoon Asia that follows the withdrawal of monsoon is called
- Pre-monsoon
  - Post-monsoon
  - Peak monsoon
  - All of the above.
25. The Department of Forest was the first Department established in Bhutan in the year 1952. The Department was again the first to enact the Forest Act to legitimize the use and control of forest resources in the year \_\_\_\_\_.
- 1957
  - 1963
  - 1966
  - None of the above.

26. Southern foothills of the Bhutan Himalaya is warm and dry in winter and hot and wet in summer. Thus, deciduous trees are also known as rain green deciduous trees. One example of such tree is
- Acer*
  - Alnus*
  - Populus*
  - Lagerstromieia*
27. The network of protected areas constituted 51.44 % of the total land area of Bhutan. How many Strict Nature Reserves are there included in the Protected Area System of Bhutan?
- 1 strict nature reserve
  - 3 strict nature reserves
  - 5 strict nature reserves
  - None of the above.
28. Bhutan is implementing REDD+ readiness and in the final stage of completing the REDD+ Strategy document. What do you understand by REDD +?
- Countries' efforts to reduce emissions from deforestation and forest degradation, and foster conservation, sustainable management of forests, and enhancement of forest carbon stocks.
  - Reducing environmental impact from deforestation and forest degradation.
  - Reduction of emission from forest degradation and deforestation for clean air.
  - All of the above.
29. 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 the mandate of GBCL is
- undertake afforestation program.
  - logging and plantation.
  - carry out road side plantation.
  - None of the above.
30. Bhutan's network of protected areas are implementing a unique project to build the capacity of the park officials, develop infrastructures and conduct researches to make our protected areas self-sustaining in the long run. This unique project is called
- Project Finance for Permanence.
  - Bhutan Trust Fund for Environmental Conservation Project.
  - WWF Conservation Project.
  - UNDP Biodiversity Conservation Project.

**PART II – Short Answer Questions (20 marks)**

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

1. Bhutan is blessed with abundant water resources in the form of rivers, streams, lakes and glaciers. Give one important intervention to protect and keep these resources for present and future.
2. Why thinning in the forest is important for forest management? Which type of forests are important for thinning and why?
3. This year we observed pine die-back in many places of western Bhutan. Is it a threat to the forest ecosystem and what could be the reason of pine die-back?
4. Timber resources are abundant in Bhutan with over 70% forest cover. Yet timber prices are quite high and not readily available in the urban areas leading to illegal loggings in rural areas. Why is this happening in the resource abundant?

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 STUDY I: Floristic composition of two forest types (Type A & Type B)

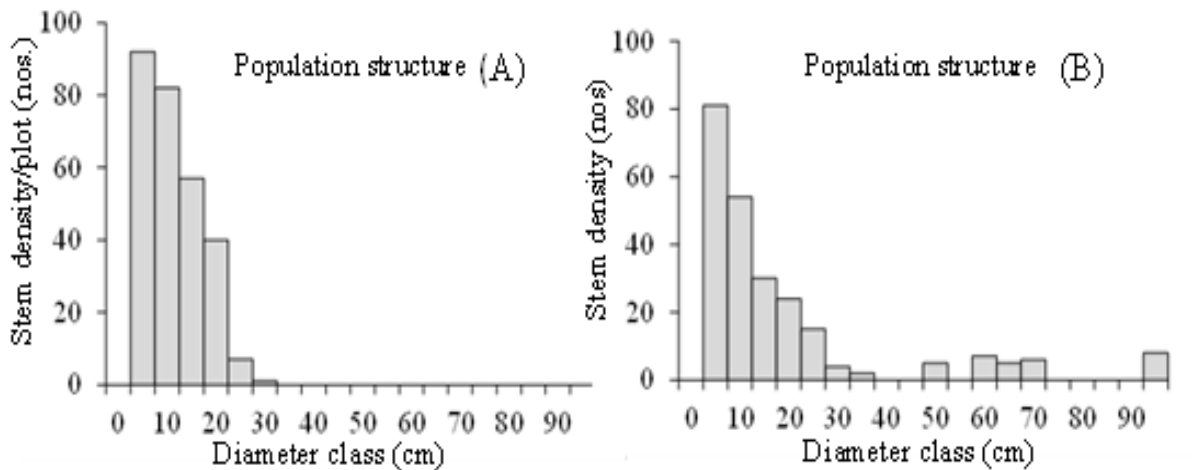
Bhutan is located in the midst of the humid east Himalaya and exhibits different forest types from the southern foothills of sub-tropical broad-leaved forest types to alpine vegetation types in the northern higher altitudes. The floristic compositions of two forest types were shown below in *Table 1*.

The population structures of two forest stands were also illustrated in *Figure 1*. Diameter class distribution helps to understand the regeneration dynamics of the forest and clarify on the type of regeneration the particular plant species exhibits. Study *Table 1* and *Figure 1* below carefully and answer the following questions.

**Table 1: Floristic composition of two different forest types (A & B). RBA refers to Relative Basal Area and H' refers to Shannon Diversity.**

Forest type A		Forest type B	
Species name	RBA H'	Species name	RBA H'
<i>Quercus lamellosa</i>	40.6 -0.5	<i>Juniperus recurva</i>	87.1 -0.2
<i>Exbucklandia populnea</i>	33.3 -0.5	<i>Abies densa</i>	6.4 -0.3
<i>Cinnamomum sp</i>	9.7 -0.3	<i>Rhododendron arboreum</i>	3.6 -0.2
<i>Castanopsis tribuloides</i>	5.8 -0.2	<i>Prunus rufa</i>	2.6 -0.1
<i>Alcimandra cathcartii</i>	4.4 -0.2	<i>Betula alnoides</i>	0.2 0.0
<i>Symplocos sumuntia</i>	2.7 -0.1	<i>Viburnum erubescens</i>	0.1 0.0
<i>Eurya acuminata</i>	1.5 -0.1	<i>Rhododendron barbatum</i>	0.1 0.0
<i>Symplocos glomerata</i>	1.3 -0.1	<i>Rosa sericea</i>	0.0 0.0
<i>Symplocos ramosissima</i>	0.2 0.0	<i>Daphne bholua</i>	0.0 0.0
<i>Myrsine semiserrata</i>	0.1 0.0	<b>Total</b>	<b>100 -0.8</b>
<i>Symplocos lucida</i>	0.1 0.0		
<i>Persea clarkeana</i>	0.1 0.0		
<i>Brassaiopsis sp</i>	0.0 0.0		
<i>Ficus neriifolia</i>	0.0 0.0		
<i>Eriobotrya dubia</i>	0.0 0.0		
<i>Lindera sp</i>	0.0 0.0		
<b>Total</b>	<b>100 -2.2</b>		





**Figure 1: Population structure of two different forest stands as demonstrated by diameter class distribution.**

1. What type of forest *Table 1 A* illustrates? In such forest types, what is the recommended silvicultural management? Similarly, which type of population structure this forest type can exhibit? (15 marks)
2. Describe briefly *Forest Type B (Table 1)*. What type of regeneration does this forest type exhibit? What type of climatic conditions does this type of forest require? (15 marks)
3. What are the dominant tree species in *Forest Type A & B*? Can you find the two forest types in Bhutan? Which forest type showed higher species richness? (10 marks)
4. Based on the population structure given in *Figure 1*, describe briefly the regeneration types in *Figure 1 (A and B)* exhibit. (10 marks)

### CASE STUDY II: Management of sub-tropical broad-leaved forest

The subtropical forest extends from the plains of the foothills up to 1000 m a.s.l. (100-1000 m a.s.l.). The dominant tree species of the subtropical forest are *Acrocarpus fraxinifolius*, *Bombax ceiba*, *Daubanga grandiflora*, *Pterospermum acerifolium*, *Shorea robusta*, *Tetrameles nudiflora* and *Dalbergia sisoo*. On most of the foothills, teak plantation was established as commercial tree species. This forest is also important habitat for mega fauna such as tiger, elephant and other wildlife species. However, this forest type is under constant threats from poachers, encroachment and fragmentation, developmental activities and to mining/quarrying activities.

1. Why subtropical forest is important to protect and conserve besides the reason cited above? Discuss long-term measures to manage this forest. (15 marks)

2. Since this forest type is located along the southern foothills, it has significant importance with respect to the Monsoon Asia. What is the relationship of subtropical forest and Monsoon Asia?  
(15 marks)
3. How are subtropical forest being utilized by the local communities? (10 marks)
4. The Southern foothills are also found rich in mineral deposits (gypsum, dolomite, white lime stone etc) and economically attractive for exploitation. How can we make best use of those mineral deposits? (5 marks)
5. Human-wildlife conflict is a serious issue in Bhutan including southern parts of Bhutan (elephant, wild pig, barking deer). Give some possible solutions to mitigate human-wildlife conflict besides electric fencing. (5 marks)

**TASHI DELEK**