

**ROYAL CIVIL SERVICE COMMISSION
CIVIL SERVICE COMMON EXAMINATION (CSCE) 2008
EXAMINATION CATEGORY: TECHNICAL**

PAPER III: SUBJECT SPECIALIZATION PAPER for FORESTRY

Date	: 20/12/2008
Total Marks	: 100
Examination Time	: 2.5 hours
Reading Time	: 15 Minutes

INSTRUCTIONS

1. Write your Roll No. (Registration Number) clearly on the answer booklet in the space provided.
2. The first 15 minutes is being provided to check the number of pages, printing errors, clarify doubts and to read the instructions. You are **NOT PERMITTED TO WRITE** during this time.
3. Use either **Blue** or **Black** ink pen or **Ball** point pen for the written part and **H.B. Pencils** for the sketches and drawings
4. This Question Booklet consists of **10 pages** including the instruction page. It is divided into two sections – namely SECTION A and SECTION B.
5. **SECTION A** consists of two parts. **Part I and Part II.**

Part I consists of 30 multiple choice questions carrying one (1) mark each and is **compulsory**. The answer of your choice should be clearly written **in whole** along with the question and option number on your answer booklet.

Part II consists of four (4) short answer questions of five (5) marks each and all questions are compulsory.

6. **SECTION B** consists of two (2) **Case Studies** and related questions. Choose only **ONE** case study and answer all questions under your choice. Each case study carries fifty (50) marks in total. There are three (3) sub-questions and each carries marks as specified alongside the questions.
7. **Marks will be given based on the knowledge of the subject, clarity and preciseness of your response.** Long bulky answers may not necessarily be awarded marks unless the answers are analyzed and communicated well.

GOOD LUCK!

SECTION A: Consists of Part I and Part II (50 Marks)

PART I (30 Marks)

*Attempt all questions, each question carries one (1) mark. The answer of your choice should be clearly written **in whole** along with the question and option numbers on your answer booklet.*

1. The Constitution of the Kingdom of Bhutan obligates what proportion of the country's area be maintained under forest cover at all times.
 - a. 72.5%
 - b. 64.0%
 - c. 60.0%
 - d. None of the above

2. All forests and forestland in the country were nationalized through the Forest and Nature Conservation Act. Which year was the Act passed?
 - a. 1974
 - b. 1979
 - c. 1969
 - d. None of the above

3. To maintain the nation's biodiversity, the country maintains a significant proportion of its total area as protected areas in the form of National Parks, Strict Nature Reserves and Wildlife Sanctuaries. Of the total how many are strict nature reserves?
 - a. 9
 - b. 2
 - c. 1
 - d. 5

4. In 2007, the commercial extraction of sand and stone resources in the country was nationalized. Which agency was given the primary mandate to carry out this activity?
 - a. Forest Development Corporation Limited
 - b. Department of Forests
 - c. Natural Resources Development Corporation Limited
 - d. District Forest Officers

5. What is the most common type of silviculture system practiced in Bhutan outside the Forest Management Units?
 - a. Selection system
 - b. Clear felling system
 - c. Seed tree system
 - d. Clear cutting system

6. Which agency in Bhutan is currently the focal agency for the United Nations Convention on Biological Diversity?
 - a. Nature Conservation Division
 - b. National Biodiversity Centre
 - c. National Environment Commission
 - d. Ministry of Agriculture

7. One of the tree species mentioned below shows marked adaptation to fire. Which one is it?
 - a. *Pinus wallichiana*
 - b. *Pinus roxburghii*
 - c. *Quercus griffithii*
 - d. *Michelia champaca*

8. Of the various tree management techniques, in one the tree is cut very near to the ground level so that branches are encouraged to grow from the stump. Which of the following method describes this?
 - a. Lopping
 - b. Pollarding
 - c. Coppicing
 - d. Thinning

9. The major advantage of vegetative propagation of multi-purpose tree species is:
 - a. Same as producing from seeds
 - b. Maintenance of genetic integrity
 - c. Stronger saplings
 - d. Grows on acid soils

10. CITES, an international agreement restricts trade in:
 - a. Domestic animals
 - b. Chicken because of bird flu
 - c. Endangered species
 - d. Flowers

11. You will encounter the terms such as *waypoints*, *tracks* and *goto* in the use of which field instrument?
 - a. Calliper
 - b. Compass
 - c. GPS
 - d. Relascope

12. Which species from the list below belongs to the schedule I of the Forest and Nature Conservation Act?
- Blue pine
 - Willow
 - Fir
 - Cypress
13. In contrast to the bare root production system of producing forest seedlings, seeds sown for undercutting or cutting the roots of young saplings is done to:
- Reduce weed growth in the nursery
 - To get full and even planting stock
 - Reduce risk of damage through diseases
 - To produce more numbers of seedlings
14. One of the major objectives of Bhutan's national development efforts is to reduce poverty. Which forestry program mentioned below will contribute directly to this goal?
- Management of Forest Management Units
 - Management and development of Non-Wood Forest products
 - Management of Protected Areas
 - Conservation of Endangered Species
15. The utilitarian value of biodiversity can be divided into four basic categories. Which of the following are these four categories?
- Food, fibre, medicine, fuel
 - Shade, recycling, nitrogen-fixing, carbon storage
 - Food, services, information, spiritual
 - Raw materials, genetic engineering, fodder, rainfall
16. As per the Land Act 2007, individual households and communities have usufruct rights in *sokshings*:
- True
 - False
17. Simple random sampling in forest inventory yields an unbiased estimate of the population mean but is time-consuming and expensive.
- True
 - False

18. *Ips schmutzenhoferi* is a:

- a. Fungus
- b. Rodent
- c. Beetle
- d. Bird

19. Which of these is not one of the three main parts of a tree?

- a. the roots
- b. the crown
- c. the culm
- d. the bole

20. Of all the impacts of climate change, which is the most significant and worrying for Bhutan?

- a. Sea level rise
- b. Glacial lake outburst floods
- c. Reduced yield of crops
- d. Snow storms

21. In Bhutan, resin from this tree is commercially tapped for manufacture of turpentine:

- a. Blue pine
- b. Chir pine
- c. Juniper
- d. Spruce

22. The equivalent of 15 hectares is:

- a. 30.06 acres
- b. 37.06 acres
- c. 40.00 acres
- d. 45.66 acres

23. The best method to determine diameter, height and volume increment through out the life of a tree with annual growth rings is:

- a. Stump analysis
- b. Cross cutting
- c. Stem analysis
- d. Increment boring

24. The correct quarter girth formula for calculating volume of logs is:

- a. $(g/4)^2 \times l$
- b. $(g/4)^2 \times l^2$
- c. $2(g/4) \times l$
- d. $(g/4) \times l$

25. In forestry mensuration, crop diameter is defined as:

- a. the diameter and height of all trees in the crop
- b. diameter corresponding to basal area of a uniform, generally pure crop
- c. diameter corresponding to mean basal area of a uniform, generally pure crop
- d. the diameter of the area of forest covered by a uniform, pure crop

26. In forestry survey, azimuths may have any value between:

- a. 0 – 90 degrees
- b. 90 – 180 degrees
- c. 0 – 360 degrees
- d. 180 – 360 degrees

27. The maximum ceiling area per household for establishment of a community forest as per the Forest and Nature Conservation Rules 2006 is:

- a. 2.0 hectares
- b. 2.5 hectares
- c. 3.5 hectares
- d. 5.0 hectares

28. The foundation stone for a new park in the country was laid at Zhabjethang in Bumthang on 13 December 2008. What is the name of this park:

- a. Wangchuck Centennial Park
- b. Wangchuck Centennial National Park
- c. Wangchuck National Park
- d. Jigme Wangchuck National Park

29. The latin name for the national animal of Bhutan is:

- a. *Moschus chrysogaster*
- b. *Budorcas taxicolor*
- c. *Neofelis nebulosa*
- d. *Capricornis sumatraensis*

30. Blue poppy (*Meconopsis grandis*), the national flower of Bhutan is called in Dzongkha as:

- a. *Bhreengee radza*
- b. *Pangen meto*
- c. *Yartsa Goenub*
- d. *Tsherngoen meto*

PART II (20 Marks)

Attempt all questions, each question carries five (5) marks. Marks will be awarded based on the knowledge of the subject, clarity and preciseness of your response.

1. Forest fires pose a major threat to natural resource management and the environment in Bhutan. Anthropogenic sources are the major causes of forest fires in the country and therefore community participation in forest fire prevention and management program is crucial to its long-term success. Discuss in your view why community participation is important and how this can be effectively coerced?
2. Takin as the national animal of Bhutan is listed as totally protected in forestry legislation. In recent times, there has been a lot of media and public attention on construction of guest houses on the takin migration corridor opposite Gasa Hot Springs (*Tsachhu*). In your opinion, should such development activity take precedence over conservation and protection of our natural heritage? Argue using the above case.
3. What are the major impacts of climate change for Bhutan? Describe citing examples.
4. Define ecotourism. What are the possible environmental, socio-cultural impacts of ecotourism in Bhutan? Explain.

SECTION B (50 Marks)

From the given case studies, choose one and attempt all questions. Each question carries marks as specified alongside the questions.

CASE STUDY 1: Legalization of *Cordyceps sinensis*: A boon to highland communities.

Cordyceps sinensis, commonly known as Chinese caterpillar grows in high altitude alpine areas across the country. The species is a rare association of moth caterpillar and fungus which is highly prized in the international market for its medicinal properties. Cordyceps is included under Schedule I of the Forest and Nature Conservation Act 1995 and therefore is a totally protected species. Legal harvesting of this species was allowed in 2004 by the Government with objectives to uplift livelihood of communities in cordyceps growing areas, to promote sustainable management and responsible harvesting of this species and to encourage legalized trade mechanisms. Since its legalization, local production and trade of cordyceps has steadily increased over the years. In 2007, the local collectors fetched exceptionally high prices, with bid values going over Nu. 400,000 at some auction sites. During the same year, more than 140 kilogrammes of cordyceps was auctioned across the country, fetching more than Nu. 40 million for the beneficiary communities.

Licensed Bhutanese dealers buy cordyceps at auctions and export to third countries mostly in unprocessed form. The major international markets tend to be associated with practitioners of Traditional Chinese Medicine (TCM) including Hong Kong, Taiwan, Singapore, Malaysia, and the United States. There are also sizeable markets in Japan and Korea because of their lengthy histories of dealing with TCM. The marketing of cordyceps from Bhutan seems handicapped by the lack of knowledge about the country. Examples of fraudulent behaviour (broken Cordyceps joined by sticks, glue, etc.) have been observed both at auction and export levels, which could prove detrimental to credibility of Bhutanese dealers as a newly emerging exporter.

In the wake of very high current earnings and potential for future income, the sustainability of the resource and impacts of collection have received very little attention, especially at the community level. Recent field observations at collection areas in Lingzhi indicate that some sites harvested in 2004 are still in degraded condition. The high influx of cordyceps collectors and pack animals pose significant threat to the fragile alpine ecosystem. In addition, pollution and garbage problems have increased manifold, placing critical watershed areas and wildlife habitat at risk. On the social side, due to high earnings from cordyceps, people often show lack of interest in other activities, including small budget programs and activities aimed at increasing rural income.

Questions:

1. If you were a forestry researcher, what are the three key areas of research you would prioritize with regards to cordyceps harvesting policy, management and impacts? You may list the research titles. (10 marks)
2. Discuss possible ways of sustainably harvesting cordyceps recognizing the need to boost production while at the same time minimizing adverse impacts on the alpine ecosystem (garbage, soil, etc) and wildlife habitat. (20 marks)

3. There is increasing trend in production of cordyceps over the years and potential for a steady market both in and outside Bhutan. In this light, discuss how export and marketing of cordyceps can be improved and how it can be made available to local consumers. (20 marks)

CASE STUDY 2: Bhutan's Forests: Current Utilization and Prospects

With the country having a high percentage of forest cover, there is fairly high potential for extracting timber resources in the country. The total estimated standing growing stock on all forestland is estimated at 23 billion cft corresponding to an average stock of 8200 cft per hectare. However, the entire stock of forests cannot be utilized due to strict environmental regulations and lack of commercial and technical feasibility. At present only about 10 percent of the total land area is considered as forests suitable for commercial production. This includes areas under the 15 FMUs and other planned FMUs. The presently operational FMUs and the planned areas are all located along the highway for easy road access. An additional 15 percent of the land area can be brought under production. However, due to lack of motor road access these areas cannot be utilized at present. The main constraint is the high cost of road construction in the country due to the rugged terrain and poor slope stability. Commercial logging is restricted in the vicinity of local settlements as these areas are reserved for rural use. Given the present forest policy and operational limitations for technical and commercial reasons, only about 6 percent of the total forest areas and 4 percent of the total land area is commercially utilized.

While the total forest stock is an important indicator of existing resources, it is equally important to assess the annual allowable cut (AAC) as it provides a dynamic measure of resource sustainability. The AAC is defined as the volume of timber that can be harvested from a particular area in any one year without harming future sustainability. The AAC for each FMU is derived from assessing one year without harming future sustainability. The Department of Forests estimates that with a Mean Annual Increment (MAI) of 2 percent of the standing volume, the AAC is 35 million cft (1 million cubic metres) per annum if the 10 percent of total land area which is under management plans and those yet to be included under the management plans are fully utilized. The AAC does not have a direct relation to the requirement by law to maintain 60 percent of the total land area under forest cover.

From the above assessment, it is evident that Bhutan's timber resources are largely under-utilized from both the stock as well as harvest perspective. Although there is potential to extract more than the double the present amount of timber on a sustainable basis from the FMUs, there are several constraints such as lack of road access, lack of skilled personnel, strict environmental regulations, characteristics of forests, lack of technology, ban in export of timber etc in reaching the target.

Questions:

1. Do you agree with the above assessment that the overall production capacity can be enhanced? Please explain your answer considering how you suggest the constraints listed above to be overcome. (20 marks).

2. The Case study argues that the AAC estimated by the Department of Forests does not have a direct relation to the requirement by law to maintain 60 percent of the total land area under forest over. In your own views, explain how a scientifically determined percentage of forest coverage can be maintained for the country using the ACC. (10 marks)

3. Bhutan has very strict environmental regulations. In your opinion what are the pros and cons of these strict environmental regulations. You are encouraged to provide this answer from various stakeholders' perspectives such as the government, business, farmers etc. (20 marks)