

ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2011

EXAMINATION CATEGORY: **TECHNICAL**

PAPER III: SUBJECT SPECIALIZATION PAPER for **FORESTRY**

Date : October 30, 2011
Total Marks : 100
Examination Time : 2.5 hours (2 hours 30 minutes)
Reading Time : 15 Minutes

INSTRUCTIONS

1. Write your Roll 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 **pencils** for the sketches and drawings.
4. All answers should be written on the Answer Booklet provided.
5. This Question Booklet consists of **9 pages** including this instructions page. It is divided into two parts-**SECTION A** and **SECTION B**.
6. **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 all questions are **compulsory**.

Part II consists of four (4) short answer questions of five (5) marks each and all questions are **compulsory**.
7. **SECTION B** consists of two **CASE STUDIES**. Choose only **ONE** case study and answer all questions under the case study of your choice. The case study carries a total of fifty (50) marks.
8. Marks will be awarded based on the knowledge of the subject, clarity and preciseness of your answers.

SECTION A: Consists of Part I & Part II carrying a total of fifty (50) marks

PART I (30 Marks)

All questions are compulsory and each question carries one (1) mark. In the answer booklet, please clearly write down the question number and your answer choice along with the answer.

1. The present director of Department of Forest and Park Services is:
 - (a) Mr. Dawa Tshering
 - (b) Mr. Ugyen Thinlay
 - (c) Mr. Karma Dukpa
 - (d) Mr. Sangay Thinlay

2. Watershed Management Division under the Department of Forest and Park Services for the first time has launched a **Payment for Environmental Services (PES)** pilot scheme on December 1, 2010 in:
 - (a) Paro
 - (b) Phobjikha
 - (c) Thimphu
 - (d) Mongar

3. The scientific name of Lemon Grass used for extraction of Lemon Oil:
 - (a) *Cymbopogon flexuosus*
 - (b) *Cymbopogon bhutanicus*
 - (c) *Cymbopogon munroi*
 - (d) None of the above

4. The total percentage of protected areas and biological corridors consists of:
 - (a) 42.71 %
 - (b) 50.00 %
 - (c) 51.50 %
 - (d) 51.32 %

5. The present Chief Forest Officer of Wild-life Division, Department of Forest and Park Services is:
 - (a) Dr. Sonam Wangyel Wang
 - (b) Dr. Sangay Wangchuk
 - (c) Dr. D.B. Dhital
 - (d) None of the above

6. Forest Research Division of the Department of Forest and Park Services was established at Taba in the year:
- (a) 1952
 - (b) 1972
 - (c) 1992
 - (d) 1987
7. How many temperate *Pinus* species are found in Bhutan?
- (a) 1
 - (b) 5
 - (c) 4
 - (d) 3
8. Among the different *Pinus* species found in Bhutan, which pine has cluster of three leaf needles,
- (a) *Pinus wallichiana*
 - (b) *Pinus bhutanica*
 - (c) *Pinus roxburghii*
 - (d) None of the above
9. How many territorial divisions are there under the Department of Forest and Park Services?
- (a) 10
 - (b) 11
 - (c) 15
 - (d) 12
10. *Exbucklandia populnea* tree was measured for its total height and diameter at breast height (DBH). It has a DBH of 56 cm and a total height of 27 m. Thus its total basal area was calculated as;
- (a) 2465.00 cm²
 - (b) 2357.00 cm²
 - (c) 2464.52 cm²
 - (d) None of the above
11. One of the following *Quercus* species (oak) is a deciduous oak.
- (a) *Quercus oxyodon*
 - (b) *Quercus semecarpifolia*
 - (c) *Quercus lamellosa*
 - (d) *Quercus griffithii*

12. One of the following primitive plants belongs to **one family, one genus and one species**.

- (a) *Tetracentron sinensis*
- (b) *Magnolia campbellii*
- (c) *Taxus baccata*
- (d) *Juniperus recurva*

13. Science of preserving animal parts, particularly skin, as a museum specimen or trophy is called.

- (a) Taxidermy
- (b) Dermatology
- (c) Taxonomist
- (d) Ornithology

14. Which of the tree species mentioned below is relatively drought resistant?

- (a) *Tsuga dumosa*
- (b) *Quercus glauca*
- (c) *Pinus roxburghii*
- (d) None of the above

15. The farmers of Nobding, Sephu and Rukubji extensively used the following natural resource (NTFP) making bamboo products:

- (a) *Yushania microphylla*
- (b) *Thamnocalamus spathiflorus*
- (c) *Borinda grossa*
- (d) *Dendrocalamus sikkimensis*

16. Bamboo flowering is a natural phenomena and it occurs once in every:

- (a) Decade
- (b) Life time
- (c) 50 years
- (d) Every alternate years

17. Collection of *Ophiocordyceps sinensis*, a high value, low volume NTFP resource was legalized in 2004 to uplift livelihood of farmers in cordyceps growing areas. For how long the farmers are allowed to collect Cordyceps?

- (a) 1 month
- (b) 2 months
- (c) 3 months
- (d) 1.5 month

18. A series of die-back was observed over a decade in the plantation forest in two western Dzongkhags of Paro and Thimphu. Which tree species was affected?
- (a) *Abies densa*
 - (b) *Quercus lanata*
 - (c) *Quercus griffithii*
 - (d) *Pinus wallichiana*
19. The equivalent of 2 hectares is:
- (a) 2000 m²
 - (b) 200 m²
 - (c) 20000 m²
 - (d) 20 m²
20. The plant species used as raw materials for traditional paper making belongs to the family Thymeleaceae. The two types of paper produced are Dhey-kar and Dhey-nap. Which plant produces Dhey-kap?
- (a) *Dhapne bhoula*
 - (b) *Dhapne sureil*
 - (c) *Dhapne involucrata*
 - (d) *Edgeworthia gardneri*
21. Royal Society for Protection of Nature (RSPN) has been a key player in conservation of endangered bird in Phobjikha valley. The endangered bird is:
- (a) *Ardea insignis*
 - (b) *Lophura leucomelanos*
 - (c) *Grus nigricollis*
 - (d) *Tragopan satyra*
22. The global population of critically endangered **White-bellied Heron** is less than 200 and Bhutan alone has:
- (a) 30
 - (b) 26
 - (c) 27
 - (d) 50
23. The Juvenile White-bellied Heron hatched under captive breeding was 134 days old when it was released on:
- (a) 10th September 2011
 - (b) 15th September 2011
 - (c) 20th September 2011
 - (d) 17th September 2011

24. The deciduous conifer of Bhutan is:
- (a) *Larix griffithii*
 - (b) *Abies densa*
 - (c) *Picea spinulosa*
 - (d) *Tsuga dumosa*
25. One of the following *Quercus* species (Oak) is found in the humid forest of Bhutan Himalaya:
- (a) *Quercus lanata*
 - (b) *Quercus semecarpifolia*
 - (c) *Quercus griffithii*
 - (d) *Quercus lamellosa*
26. In a private forest, the most suitable silvicultural system will be:
- (a) Group selection cutting
 - (b) Strip clear cutting
 - (c) Patch cutting
 - (d) Single tree selection cutting
27. The validity of a **Management Plan** of any community forests is for
- (a) 20 years
 - (b) 15 years
 - (c) 3 years
 - (d) 10 years
28. Resin which is commercially tapped for manufacturing turpentine is mainly tapped from:
- (a) Blue pine
 - (b) Hemlock
 - (c) Fir
 - (d) Chirpine
29. Diameter at breast height (DBH) of tree above 1.3 m from the ground is measured to calculate:
- (a) Total height
 - (b) Basal area
 - (c) Volume
 - (d) None of the above

30. The widely accepted tree line of Bhutan is at:

- (a) 3000 m a.s.l.
- (b) 2000 m a.s.l.
- (c) 5000 m a.s.l.
- (d) 4000 m a.s.l.

PART II (20 Marks)

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

1. Evergreen broad-leaved forest was studied to understand the broad-leaved forest ecology and growth dynamics. During the field survey, *Lithocarpus pachyphylla* was measured. It has a diameter at breast height (DBH) of 245.5 cm and a height of 30 m.

Q. Calculate the total basal area of *Lithocarpus pachyphylla* in m².

2. Phobjikha valley is an important habitat for endangered Black-necked Crane particularly as a roosting site during winter. On the other hand, the farmers cultivate potato and keep cattle. The wide valley is also a place for tourist attraction resulting in introduction of resorts and hotels. For all these developmental activities, road networks are inevitable.

Q. You as environmentalist and forester, what are the likely impacts on the future wet-land habitat of Phobjikha valley? Will the Black-necked Crane population likely to increase or decrease?

3. Tala Hydro Power Project (THPA) as a stakeholder of the Wang River Basin is investing certain amount of budget in rehabilitation of the River Basins between Paro and Thimphu. The budget is mainly used for plantation of the dry open sites.

Q. Is it a good investment to do plantation in a climatically dry sites? State your reason for the answer.

4. Bhutan Board Products Limited Company (BBPL) after harvesting humid evergreen broad-leaved trees at Gedu-Darla region started planting *Cryptomeria japonica*, exotic conifer species in the harvested area.

Q. What is your opinion on the approach by BBPL?

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 I: Secondary succession and soil development in *tseri*-farming system (Shifting cultivation), Shemgang, southern Bhutan

Secondary succession of vegetation after *tseri*-farming system (shifting cultivation) was investigated in Buli region, Shemgang. The *tseri* is maintained as 12 years of rotational cycle with major crops of finger millet or buckwheat. After one or two year cropping, fallow phases start from herbaceous vegetation up to 4 years, and then gradually replaced by closed forest. Total flora of this successional series amounted to ca. 250 species with equal proportion of herbaceous and tree species. The fallow periods can be divided into five stages including the climax stage as the control. The first two herbaceous stages of annual and perennial species lasts 4 years with high pH, low-organic matter, high available-Phosphorus, though the site characteristics fluctuate greatly. After herbaceous stages, woody species make closed canopy and reach to 15-20 m tall at 10-12 years. Woody life-forms change from deciduous/evergreen shrubs to evergreen broad-leaved trees, and soils become more acidic, soil organic-Carbon (C) often high but total Nitrogen (N) is still low (stagnating periods for the soils), and around 20 years, forest change in structural organization, by protruding emergent above main canopy, and the community height (35 m) reached at nearly 70 % of the climax forest, soil become more acidic, both C and N reach the level of climax forest. According to this pattern, it is concluded that 12 years of fallow periods in *tseri* is critically balanced for rotational use without too much labour input to maintain sustainably.

On the other hand, the Government already phase-out shifting cultivation considering the practice of shifting cultivation is unsustainable and destructive to the forest.

Q.1. As a forester, do you support the statement of phasing-out Tseri practice (Shifting cultivation) in Bhutan? Is Tseri cultivation destructive or sustainable practice? Discuss your points **(25 marks)**

Q. 2. If you are a farmer practicing Tseri, what is your opinion on Governments policy of phasing-out Tseri and converting it to permanent cultivation field? Please discuss your points **(20 Marks)**

Q. 3. Is there any implication on food security of the rural communities by phasing out Tseri practice in Bhutan? **(5 marks)**

CASE STUDY II: Impact of developmental activities on the Evergreen Broad-leaved Forest: A case of Wasabi Pilot Project at Lamperi

Human interventions on the forest resources can be classified into three broad categories; firstly, the traditional type of human intervention which includes collection of non-timber forest products, selectively extracting timber for rural house construction, firewood collection, leaf litter collection for cattle bedding, collection of fodders and manufacture of agricultural implements such as plough, tools handle. Secondly, the traditional farming system of rotating the field for agriculture crops such as shifting cultivation (Tseri) that prevails since thousands of years, and thirdly the developmental projects including agricultural, infrastructural, and hydro power project development.

One example of Agricultural development project was Bhutan Wasabi Pilot Project (WP). This project was established by Bhutan Agrotech Research & Development Organization (BARDO) in 1998 at Lamperi with the objective to promote cash crops for increasing the income of rural farmers. The land under Wasabi cultivation was leased from nearby village farmers, which were initially registered as grazing land (Tsamdro). A total land area of about 100 acres was leased from the farmers. The leased forest was fenced and all undergrowth, bushes, shrubs and weeds were cut and cleared for Wasabi cultivation. The forest tree roots lying within 30 cm were cut and extracted. The cleared land was tilled to about 30 cm and the soil beds were raised with fine soil for Wasabi seedling plantation. Several thousand Wasabi seedlings were planted by the project implementer and expected a bountiful harvest.

However, after about three years of Wasabi plantation, the Project failed due to lack of management practices and low return. The project was close completely. The abandoned Wasabi project site was heavily disturbed by wild animals. The disturbed sites were also colonized by noxious perennial weeds and invasive plants such as *Rumex*, *Sambucas*, *Senecio* etc.

Now, the site is designated as Royal Botanical Park with several infrastructure developments such as visitor centre, café, cycling routes, camping sites and play ground for the urban dwellers.

Q. 1. What lesson did you learn from the above extract? List down the lessons learned from the project? **(10 marks)**

Q. 2. Can evergreen broad-leaved forest withstand such disturbances? What are the likely impacts on the biodiversity of the forest, wild-life habitat and even to the local cattle herders? **(25 marks)**

Q. 3. What are your arguments on the establishment of the Urban Park in the midst of the humid Evergreen Broad-leaved Forest? What alternatives do you suggest for the management of important Humid Broad-leaved forest such as Lamperi? **(15 marks)**.