ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2016
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALIZATION PAPER FOR AGRICULTURE

Date:	2 October 2016
Total Marks:	100
Examination Time:	150 minutes (2.5 hours)
Reading Time:	15 minutes *(prior to examination time)*

GENERAL INSTRUCTIONS

1. Write your Registration Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is being provided to check the number of pages, printing error, clarify doubts and to read instructions in Question Paper. You are NOT permitted to write during this time.
3. This paper consists of **TWO Sections, namely Section A and 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 2 case studies. Choose only **ONE** case study and answer the questions under 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 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. The Question paper has 7 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 (c). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

1. The Chinese citrus fruit flies are found to be attracted to
   a. blue colour.
   b. green colour.
   c. orange colour.
   d. red colour.

2. De-hulled rice grain is called
   a. Rachilla
   b. Awn
   c. Tegmen
   d. Caryopsis

3. The optimal temperature (in degree Celsius) for flowering of rice plant is
   a. 18-22
   b. 20-25
   c. 30-33
   d. 25-30

4. The part of the cereal grain that we eat as food is
   a. Endosperm
   b. Lemma
   c. Palea
   d. Scutellum

5. Golden rice, although a GMO crop, has earned much fame for its ability to biosynthesize
   a. Folic acid
   b. Beta-carotene
   c. Vitamin C
   d. Vitamin D

6. Temperature which is one of the factors influencing physiological processes during crop growth, decreases as elevation increases. In general for every 100 metres increase in elevation, temperature (in degree Celsius) decreases by
   a. 0.1
   b. 1.0
   c. 0.6
   d. 1.7

7. Golden rice, a genetically engineered rice variety, contains precursors for
   a. Vitamin K
   b. Vitamin A
   c. Vitamin C
   d. Vitamin D

8. The gene for yellow colour in Golden Rice was taken from which of the following flowers?
   a. Marigold
   b. Chrysanthemum
   c. Daffodil
   d. Tulip

9. In cereal breeding, hybrid vigor is expressed at
   a. F1 generation
   b. F2 generation
   c. F5 generation
   d. F7-F8 generation

10. The New Rice for Africa (NERICA) is a cross between
    a. O. sativa and O. glaberrima
    b. O. sativa and O. nivara
    c. O. sativa and O. rufipogon
    d. O. sativa and O. spontanea

11. In Bhutan, four agro-ecological zones have been identified based on altitude, temperature and rainfall. For example, a zone with 1200-1800 masl, 17^{o}C mean temperature and 850-1200 mm rainfall is classified as
    a. Warm temperate
    b. Dry subtropical
    c. Humid subtropical
    d. Wet subtropical

12. Zhemgang Dzongkhag's agro-ecological matches that of
    a. Warm temperate
    b. Dry subtropical
    c. Humid subtropical
    d. Wet subtropical

13. Bhutanese farmers grow many traditional varieties of rice. How many have been recorded so far?
    a. 55
    b. 305
    c. 500
    d. 920

14. Which of the following is NOT a high altitude traditional rice variety of Bhutan?
    a. Jaswa
    b. Naam
    c. Hasey
    d. Dumbja

15. Raising a subsequent or second crop from the main crop is called
    a. Ratooning
    b. Double-cropping
    c. Relay cropping
    d. Subsequintial cropping

16. The development of farm mechanization in Bhutan started in the year
    a. 1963
    b. 1973
    c. 1983
    d. 1993

17. Nitrate-nitrogen can be lost from soil to the atmosphere by conversion to gaseous N_2O or N_2 under anaerobic conditions by a variety of bacteria. This process is called
    a. Nitrification
    b. Denitrification
    c. Ammonification
    d. Nitrogen mineralization

18. A typical Japanese-made Kubota powertiller has
    a. 12 horsepower
    b. 40 horsepower
    c. 100 horsepower
    d. 300 horsepower

19. Soils with cation exchange capacity in the range of 5-15 meq.$100g^{-1}$ would be classified as having
    a. Low CEC
    b. Moderate CEC
    c. High CEC
    d. Very high CEC

20. In general, with regard to aluminium toxicity, Bhutanese soils are characterized as having
    a. Minimal toxicity
    b. Medium toxicity
    c. High toxicity
    d. Very high toxicity

21. Studies have found that on average a rice crop can remove
    a. 25 kg N per ha
    b. 46 kg N per ha
    c. 77 kg N per ha
    d. 92 kg N per ha

22. Nutrient deficiency symptoms can usually show on leaves. For example deficiency of Mg, K and Mo are visible mostly in
    a. young leaves.
    b. mid-age leaves.
    c. mature leaves.
    d. leaves of any age.

23. Which of the following is NOT an essential micro-nutrient for plant growth?
    a. Phosphorus
    b. Iron
    c. Zinc
    d. Manganese

24. When we say maize belongs to Poacea, we are referring to its
    a. Order
    b. Family
    c. Sub-family
    d. Genus

25. Which of the following is a distinguishing feature of sedges?
    a. Usually monocots with two ranked leaves.
    b. Leaves have ligules and auricles.
    c. Stems are usually triangular.
    d. Have tap root system.

26. Which of the following is a broadleaved weed?
    a. Potamogeton distinctus
    b. Cyperus difformis
    c. Cynodon dactylon
    d. Setaria pumila

27. The chemical Butachlor is a
    a. Herbicide
    b. Fungicide
    c. Rodenticide
    d. Insecticide

28. *Oryza sativa f.spontanea* is a
    a. Red rice variety exported to USA

b. Weedy rice
c. Upland rice
d. Lowland rice

29. In general, when people's income increase, the share of their demand for cereals in their food basket
    a. increase
    b. decrease
    c. stays same
    d. None of the above applies.

30. Suppose a tariff is put on import of Indian rice, the demand curve for Bhutanese-grown rice will
    a. shift to left.
    b. shift to right.
    c. move vertically up.
    d. move vertically down.

PART II – Short Answer Questions (20 marks).

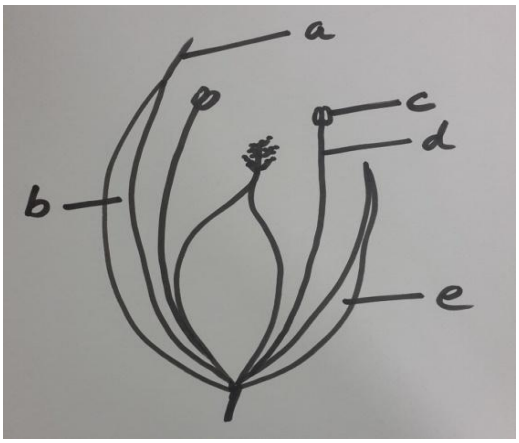
This part has 4 Short Answer Questions. Answer ALL the questions. Each question carries 5 marks.

1. Match the following diseases on the left with their causal agent on the right (5 marks).

(a) Rice blast	(k) *Magnaporthe grisea*
(b) Wheat rust	(l) *Phytophthora infestans*
(c) Potato blight	(m) *Cersospora*
(d) Ginger rot	(n) *Pythium aphanidermatum*
(e) Maize gray leaf spot	(o) *Puccinia grammis*

2. Write five differences between monocots and dicots (5 marks).

3. Name the parts labelled **a** to **e** in the following diagram of a wheat flower (5 marks).



4. Following are data on price (Nu/piece) of onion sold from 6 shops in Thimphu:

   3 7 3 4 5 8

   (a) Find the median (1 mark).

   (b) Find the mode (1 mark).

   (c) Find the interquartile range (1 mark)

   (d) Find the range (1 mark).

   (e) If price was collected from one more shop and the price was Nu.18/piece, how would you describe that value in statistical terms? (1 mark).

SECTION B

Case Study

Choose either Case 1 or 2 from this section. Each case study carries 50 marks.

Case 1

The agricultural subsidy provided to Bhutanese farmers is not adequate enough to encourage robust farming. To what extent do you agree or disagree with this statement? Support your arguments with evidence.

OR

Case 2

When inorganic fertilizer containing nitrogen, potassium and phosphorus is applied to the field soil, a chain of bio-chemical and physical processes takes place depending on the rate applied, soil type, cropping system and management decisions followed by the farmer. This determines the extent to which nutrients are taken up by crops or lost. Write an essay describing recommended practices that a farmer should follow in applying inorganic fertilizer assuming a scenario where a farmer grows irrigated paddy followed by potato. Give examples, simple diagrams or chemical equations wherever necessary to better illustrate your points.

TASHI DELEK