

PAPER III: SUBJECT SPECIALISATION PAPER FOR AGRICULTURAL ENGINEERING

**ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2025
EXAMINATION CATEGORY: TECHNICAL**

PAPER III: SUBJECT SPECIALISATION PAPER FOR AGRICULTURAL ENGINEERING

Date	:	October 11, 2025
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 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 QuestionsAll 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 the Section, Part and Question Number will NOT be evaluated and no marks will 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 1: 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. During the operation of farm machines, if the machine produces black smoke, it indicates
 - a) Burning of lubricant in the cylinder
 - b) Presence of water in fuel
 - c) Engine is overloaded
 - d) None of the above
2. Process of adding vitamins to milk is known as
 - a) Flavouring
 - b) Fortification
 - c) Fermentation
 - d) Sterilization
3. Muffler is provided on tractor to control
 - a) Noise
 - b) Vibration
 - c) Fuel consumption
 - d) Fuel supply system
4. A normal plowing depth for agriculture practice is
 - a) 15 cm
 - b) 30 cm
 - c) 40 cm
 - d) 100 cm
5. The device that permits one of the rear wheels of tractor to rotate faster than the other at the turning is called
 - a) Power train
 - b) Clutch
 - c) Differential lock
 - d) All of the above
6. Soil water potential of permanent wilting point is
 - a) 0.1 to 0.3 bar
 - b) 15 bars
 - c) 33 bars
 - d) 60 bars

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7. In Bhutan, a free-standing green house should be oriented in
 - a) South-East direction
 - b) North-South direction
 - c) North-East direction
 - d) South-West direction
8. The compression ratio of diesel engine is
 - a) 4 to 8:1
 - b) 14 to 20:1
 - c) 14 to 22:1
 - d) 1 to 20:1
9. Lysimeter is used to measure
 - a) Evaporation
 - b) Evapotranspiration
 - c) Atmospheric pressure
 - d) None of these
10. What is a draft required to pull a four bottom 30 cm tractor plough, working at a depth of 15 cm operated at speed of 6 km/h? (Soil resistance is 0.7 kg/cm^2)
 - a) 12.6 kg
 - b) 126 kg
 - c) 1260 kg
 - d) None of these
11. The carburetor of an engine is used to mix fuel with
 - a) Oil
 - b) Air
 - c) Water
 - d) All of these
12. The part of MB plough to which all other parts of plough bottom is attached, is
 - a) Mould board
 - b) Land side
 - c) Frog
 - d) Coulter
13. A function of drawbar in tractors is to
 - a) Lift the load
 - b) Hitch the implements
 - c) Hold the load
 - d) Pull the load

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14. Choke controls the amount
- a) Air
 - b) Fuel
 - c) Water
 - d) All are correct
15. What power is necessary for pulling a harrow with 50 tines, each giving a resistance of 1 kg, when the speed of harrow is 5 km/h?
- a) 0.680 kW
 - b) 680 kW
 - c) 68 kW
 - d) 6.8 kW
16. The process of grain drying involves
- a) Heat transfer
 - b) Heat and mass transfer
 - c) Mass transfer
 - d) None of these
17. Pasteurization may be defined as heating every particle of milk at least _____ temperature and holding it at that temperature for 30 minutes.
- a) 100 degree Celsius
 - b) 81 degree Celsius
 - c) 71 degree Celsius
 - d) 61 degree Celsius
18. is the power delivered by the engine at the end of the crankshaft?
- a) Indicated horsepower (IHP)
 - b) Brake horsepower (BHP)
 - c) Frictional horsepower (FHP)
 - d) Drawbar horsepower (DBHP)
19. Watershed is defined as geohydrological unit
- a) Draining to a common point/outlet
 - b) Receiving same amount of rainfall
 - c) Have similar land use
 - d) Have similar socioeconomic status of inhabitants

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20. Part of the tractor transmission system provided with the standard externally splined shaft at the rear end of the tractor used to attach a combine harvester, thresher, mover, etc is
- a) PTO
 - b) Final drive
 - c) Rear axle
 - d) Differential gear
21. is the Minimum tillage wherein primary tillage is completely avoided.
- a) Reduced tillage
 - b) Mulch tillage
 - c) Zero tillage
 - d) Rotational tillage
22. Which of the following is a main objective of puddling in paddy?
- a) Destroy insects and pests
 - b) Create an impermeable layer in the soil
 - c) Mix the fertilizer in the soil
 - d) Reduce the soil erosion
23. The term “Black gold” and “Black diamond” are usually used for
- a) Petroleum and coal
 - b) Graphite and carbon
 - c) Iron and mustard
 - d) Coal and carbon
24. Which of the following affect the traction in a tractor?
- a) Tyre width and diameter
 - b) Weight
 - c) Soil type and its condition
 - d) All of these
25. How many Tension links and Compression links are there in Three-point hitch system?
- a) 2 tension link and 1 compression link
 - b) 3 tension link and 2 compression links
 - c) 1 tension link and 3 compression links
 - d) 2 tension link and 0 compression link

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26. Detonation in an IC engine can be controlled using various methods such as

- (i) By maintaining correct mixture of fuel and air
- (ii) Proper spark setting
- (iii) Proper valve adjustment
- (iv) Using antiknock fuel

Which is the correct method?

- a) (i) and (ii)
- b) (iii) and (iv)
- c) (i), (ii) and (iii)
- d) All of the above

27. The process of uniting fuel chemically with oxygen for producing intense heat in an engine cylinder is

- a) Ignition
- b) Combustion
- c) Charging
- d) Mixing

28. The critical design criteria for feasibility of farm machines in steep slopes of Bhutan is

- a) Machine quality
- b) Tilt angle of the machine
- c) Tilt angle of plough
- d) Center of gravity of the machine.

29. What is the recommended temperature of cooling tankers while transporting the milk?

- a) 1 degree Celsius
- b) 2 degree Celsius
- c) 3 degree Celsius
- d) 4 degree Celsius

30. Sprinkle irrigation is suitable where the soil has

- a) Clayey texture
- b) Loamy Texture
- c) Undulating topography
- d) All of these

PART II – Short Answer Questions [20 marks]

This part has 4 Short Answer Questions. Answer ALL the questions. Each question carries 5 marks. The marks for each sub-question is indicated in the brackets.

1. Explain the following agriculture terms
 - a) Sprayer **(1 mark)**
 - b) Combine Harvester **(1 mark)**
 - c) Transplanter **(1 mark)**
 - d) Tillage **(1 mark)**
 - e) Milling **(1 mark)**
2. Answer the following questions
 - a) Clutch is one of the important components in tractor. State its function. **(2 marks)**
 - b) The engine of tractor is tested for its power. What is the commonly used equipment to do the test? **(1 mark)**
 - c) What is the difference between 2 stroke and 4 stroke cycle engines? **(2 marks)**
3. Differentiate petrol engine and diesel engine **(5 marks)**
4. Calculate the seed rate per hectare of a 7 x 17 cm seed drill, whose main drive wheel is 124 cm diameter and total weight of grain collected in 20 revolutions is 0.423 kg. **(5 marks)**

SECTION B : CASE STUDY [50 marks]

Choose either Case I OR II from this section. Each case study carries 50 marks. Mark for each sub-question is indicated in the brackets.

CASE I

1. A farmer in Bumthang purchased a tractor of 45 HP at a total cost of Nu.300,000, aiming to operate for 1000 hours in a year at an interest rate of 10% after purchase. The life span of tractor is 10 years and salvage value at 10% of the initial cost. The housing cost, insurance and taxes were each at 1% of the initial cost of the tractor, fuel consumption of a tractor operation is 6 liters per hour and requires a lubricant of 30% of the fuel cost. In Bumthang area, cost of diesel is Nu.24 per liter. The repair and maintenance cost are assumed to be 6% of the initial cost yearly. The machine is operated by an operator at Nu.150 for 8 hours daily. What should be the: **(30 marks)**
 - a) Depreciation cost
 - b) Salvage value
 - c) Total fixed costs per hour
 - d) Total operating cost per hour
 - e) Overall cost of using a tractor.
2. Describe the maintenance practices required on a tractor before it is put to daily use. **(20)**

CASE II

1. Describe the components of transmission system of a tractor. **(10 marks)**
2. If a driven pulley is made to rotate at 350 rev/min by a driving pulley of 0.3-meter diameter, running at 1400 rev/min, determine: **(15 marks)**
 - a) Diameter of the driven pulley
 - b) Length of the open belt, when the pulleys are 2 meters apart and
 - c) Length of cross belt, when pulleys are 2 meters apart.
3. A four bottom, 40 cm M.B plough has a ploughing depth of 17.5 cm and draft of 1700 kg. If it is working at a speed of 5.5 km/hr. and has a field efficiency of 75%, Calculate: **(15 marks)**
 - a) Unit draft
 - b) Actual power requirement
 - c) Area covered/hr.
4. What are the factors affecting grain storage? What could be some of the probable ideas to improve grain storage in order to help Bhutanese farmers? **(10 marks)**

TASHI DELEK!