Range Forest Officer (Main / Written) Examination, 2021

AGRICULTURE ENGINEERING

Time Allowed: 03 Hours | Maximum Marks: 200

Question Paper Specific Instructions

Please read each of the following instructions carefully before attempting questions:

1. There are 08 (eight) questions in all, out of which FIVE are to be attempted.
2. Question Nos.1 and 5 are compulsory. Out of the remaining SIX questions, THREE are to be attempted selecting at least ONE question from each of the two Sections I and II.
3. Answers must be written in legible handwriting. Each part of the question must be answered in sequence and in the same continuation.
4. All questions carry equal marks. The number of marks carried by a question / part is indicated against it.
5. Attempts of questions shall be counted in sequential order. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in the Answer Booklet must be clearly struck off.
6. Unless otherwise mentioned, symbols and notations have their usual standard meanings. Assume suitable data, if necessary and indicate the same clearly.
7. Re-evaluation / Re-checking of answer book is not allowed.

SECTION-I

1. (a) Classify gully based on depth and catchment area. Describe the stages of gully development. (10)

   (b) What is bench terracing? Classify the bench terraces based on purpose and slope of bench. (10)

   (c) What is bench terracing? Classify the bench terraces based on purpose and slope of bench. (10)

   (d) Explain in brief:

   (i) Contour trenching

   (ii) Grassed waterways

   (iii) Mechanics of wind erosion

   (iv) Chute spillways

   (v) Flood water damage in watershed

2. (a) Differentiate between: (10)

   (i) Spatial resolution and Temporal resolution

   (ii) Ground observation platform and Airborne observation platform

   (iii) Geosynchronous orbit and Sun synchronous orbit

   (iv) Near-infrared and Middle-infrared region

   (b) Write short notes on: (10)

   (i) Diffraction

   (ii) Mie scattering

   (iii) GIS

   (iv) Irradiance

   (c) What are the essential components of remote sensing? Briefly explain about all the components of remote sensing? (10)

   (d) Classify remote sensors. Briefly explain how performance of sensors are evaluated based on their classifications and mapping accuracy requirements. (10)

3. (a) Briefly describe about rain guns and what are the limitations for application of rain gun irrigation system? (10)

   (b) With a neat sketch, describe the working principle of Parshall flumes. (10)

   (c) Write short notes on: (10)

   (i) Mole drainage

   (ii) Sprinkler irrigation

   (iii) Duty of water

   (iv) Coefficient of storage of aquifer

   (v) Fertigation

   (d) Differentiate between: (10)

   (i) Specific yield and Specific retention

   (ii) Infiltration and Percolation

   (iii) Water conveyance efficiency and Water application efficiency

   (iv) Surface drainage and Sub-surface drainage

4. (a) Write short notes on: (10)

   (i) Mangers

   (ii) Soakage pit

   (iii) Milking parlour

   (iv) Reinforced brick work

(v) Trench silos

(b) Enlist the advantages of multi-bay greenhouse. (10)

(c) What are the utilities of farm fencing? Depending upon the types of construction and materials used, how wire fencing is classified? (10)

(d) Briefly describe different types of loads for design and construction of a greenhouse. (10)

SECTION-II

5. (a) A disc harrow having disc diameter 560mm covers a width of 125mm and is operating at a speed of 4.5km.h^{-1}. The average soil resistance is 0.63kg.cm^{-2}. Determine the actual field capacity and horsepower required to pull the plough, if the field efficiency is 75 per cent. (10)

(b) While estimating the cost of operation of any agricultural machines, what are the sub-heads included in fixed cost? (10)

(c) Differentiate between: (10)

(i) Horizontal suction and Vertical suction

(ii) Hill dropping and Check-row planting

(iii) VMD and NMD

(iv) Octane number and Cetane number

(d) Briefly describe: (10)

(i) Volumetric efficiency

(ii) Tappet clearance

(iii) Hydrogenation

(iv) King-pin inclination

(v) Harvesting index

6. (a) Calculate the theoretical power generated by a wind rotor of 5m diameter with wind velocity of 8.5km.h^{-1}. Assume air density 1.25kg.m^{-3}. (10)

(b) What is energy plantation? For making energy plantation effective, what are the factors need to be considered? (10)

(c) Briefly describe the thermal applications of solar energy in agriculture and allied activities. (10)

(d) Differentiate between:

(i) Biomass and Biogas

(ii) Floating drum biogas plant and Fixed dome biogas plant

(iii) Beam radiation and Diffuse radiation

(iv) Solar thermal and Solar photovoltaic

7. (a) With a flow diagram explain the steps followed in canning of fruits and vegetables. (10)

(b) List out the general design considerations for milk processing plant. (10)

(c) Differentiate between: (10)

(i) Grading and Sorting

(ii) Spiral separator and Specific gravity separator

(iii) Constant rate period drying and Falling rate period drying

(iv) Thermal conductivity and Thermal diffusivity

(d) Briefly explain: (10)

(i) Heat utilization factor

(ii) Degree of grinding

(iii) Waxing / coating

(iv) Homogenization efficiency

(v) Thawing

8. (a) With a block diagram explain the basic measuring instrumentation system. (10)

(b) Differentiate: (10)

(i) Static characteristics and Dynamic characteristics of instruments

(ii) Response time and Rise time

(iii) Programmable logic controller and Programmable automation controller

(iv) Display devices and Storage devices

(c) Write in brief: (10)

(i) Hot wire anemometer

(ii) Micro-controller

(iii) Tachometer

(iv) Noise

(d) What for pressure transducers are used? Write in brief about different types of pressure transducers. (10)

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