Indian Forest Service
(Main) Exam, 2021

ZCVB-U-AGRE

AGRICULTURAL ENGINEERING

Paper – I

*Time Allowed : **Three** Hours*

*Maximum Marks : **200***

Question Paper Specific Instructions

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

*There are **EIGHT** questions in all, out of which **FIVE** are to be attempted.*

*Questions no. **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 A and B.*

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 Question-cum-Answer Booklet must be clearly struck off.

All questions carry equal marks. The number of marks carried by a question/part is indicated against it.

Unless otherwise mentioned, symbols and notations have their usual standard meanings. Assume suitable data, if necessary and indicate the same clearly.

Neat sketches may be drawn, wherever required.

*Answers must be written in **ENGLISH** only.*

SECTION A

Q1. (a) Differentiate between continuous contour trench and staggered contour trench. *8*

(b) Discuss in brief : *8*

(i) Sediment delivery ratio

(ii) Stream channel erosion

(c) (i) How does raster data format differ from vector data format in GIS ?

(ii) Differentiate between specular and diffusive reflectance. *8*

(d) Discuss about the GIS data types. *8*

(e) Discuss the ordering of each element of photointerpretation with respect to degree of complexity. *8*

Q2. (a) Discuss in brief about contour strip cropping, field strip cropping and buffer strip cropping used for conserving soil and water in a cultivated field. *10*

(b) (i) Calculate the spacing between the shelter-belt having a height of 15 m. The actual wind velocity at 15 m height is 18 kmph and threshold wind velocity at 15 m height is 9 kmph. The angle of deviation of prevailing wind direction perpendicular to the wind break is 10 degrees.

(ii) A drop inlet pipe spillway is designed for 3 m^3/s peak flow and 4 m total head. The length of the pipe is 10 m. The entrance and friction loss coefficients are 0·04 and 0·025, respectively. Calculate the cross-sectional area of the pipe. *10*

(c) Define synthetic unit hydrograph and describe its derivation method. *20*

Q3. (a) Differentiate between the approaches of USLE and MUSLE models for soil loss and comment on their ranges of utility. *10*

(b) What are the different conservation measures to be followed for the treatment of watershed having maximum stream order III ? *10*

(c) Write down the objectives of drop spillway. Discuss the advantages and limitations of drop spillway. Describe the procedure for design of drop spillway. *20*

Q4. (a) Describe the importance of spatial, spectral and temporal resolution. *10*

(b) Discuss the digital image processing sequence with the help of a flowchart. *15*

(c) Discuss application of remote sensing and GIS in Forest Management. *15*

SECTION B

Q5. (a) Discuss the basic details of border method of irrigation with a neat sketch. *8*

(b) Discuss about adaptability and limitations of sprinkler irrigation. *8*

(c) Work out the economical diameter and depth of silo/siloes to store sufficient quantity of silage for a herd of 650 dairy cows having average weight of 400 kg each. *8*

Following additional information is provided :

(i)	Number of days for which silage has to be fed	=	240 days
(ii)	Weight of 1 cu.m. of silo	=	675 kg
(iii)	Thickness of silage to be fed each day	=	10 cm
(iv)	Quantity of silage to be fed per 100 kg of body mass	=	4 kg
(v)	Maximum diameter of silo permitted	=	6 m
(vi)	Allowable loss of handling	=	10%

(d) Write in brief about different types of poultry housing systems. List out the important equipment being used in poultry system. *8*

(e) What are different types of farm fencing based on method of construction and material used ? Briefly describe the principle used for electric fencing of farm. *8*

Q6. (a) Discuss the working procedure and application of pressure plate apparatus for determining Soil Matric Potential and Water Content with the help of a neat sketch. *15*

(b) Enlist and discuss the principal methods for direct measurement of evapotranspiration. *15*

(c) Discuss the effect of speed and impeller diameter on pump performance. *10*

Q7. (a) Differentiate between the following : *15*

(i) Cipoletti weir and Rectangular weir

(ii) Sand Media filter and Screen filter

(iii) Interceptor drainage and Relief drainage

(b) Estimate the time, in hours, required to give a 4 cm irrigation to a border strip 100 metres long and 6 metres wide with a discharge of 12 litres per second from a tube-well. Assume the water conveyance efficiency to be 72%. *10*

(c) (i) Define leaching requirement. How is leaching requirement estimated for the design of subsurface drainage ? *5*

(ii) Estimate the leaching requirement when the EC of the saturation extract of the soil is 11 mmho/cm at 25 percent reduction in the yield of cotton. The EC of irrigation water is 1·4 mmho/cm. *10*

Q8. (a) Differentiate between Deep and Shallow bins. Give the merits and demerits of Bag and Bulk storage system. *15*

(b) What are the classifications of greenhouses based on shape ? List the different covering materials used for greenhouses. *15*

(c) Give a comparative analysis between Loose housing barn and Stall barn. *10*