Indian Forest Service (Main)
Examination, 2024

JBNV-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) Write a short note on the salient characteristics of precipitation on India. *8*

(b) Discuss in brief about vegetative management and tillage practices used for control of erosion by wind. *8*

(c) State the adoptability and functions of conservation ditches and contour stone wall used for control of soil erosion. *8*

(d) Discuss in brief about storage reservoirs and detention reservoirs methods adopted for control of floods. *8*

(e) Distinguish between absorption and scattering of remote sensing energy. *8*

Q2. (a) Differentiate between the approaches of 'WARASA – Jan Sahbhagita' and 'Hariyali', the watershed development programmes. *10*

(b) Discuss in brief about the main objectives, their types, limitation in use and precautionary measures to avoid failure of terraces — a soil erosion control measure. *10*

(c) Design a drop spillway to be constructed at a place in a gully having width of 5 m and drainage area of 58 ha. The net drop is 2 m. Take the rainfall intensity for duration equal to time of concentration of watershed and design return period of 25 years, as 120 mm/h. The coefficient of runoff for a watershed is 0·3. The structure is to be constructed in stone masonry. *20*

Q3. (a) Explain the criteria for land levelling design. *10*

(b) Calculate the capacity of a pond having the area enclosed by different contours as follows : *15*

S. No.	Contour value (m)	Area enclosed (m^2)
1	241	210
2	242	280
3	243	330
4	244	360
5	245	470
6	246	540
7	247	610

(c) What are geometric correction and radiometric correction in digital image processing ? *15*

Q4. (a) Discuss the application of remote sensing in land cover and land use mapping. *10*

(b) What is the significance of principal component analysis in digital image processing ? Also write down the advantages of digital image processing. *15*

(c) What is the basic premise in the Muskingum method of flood routing ? Describe a procedure for estimating the values of Muskingum coefficient K and x for a stream reach. *15*

SECTION B

Q5. (a) Enlist the structures to be used in measuring irrigation water and also write their suitability. *8*

(b) What are the characteristics of the aquifer that influence yield of wells ? Explain in brief. *8*

(c) How does waterlogging and salt accumulation affect the agricultural land adversely ? *8*

(d) What is hermetic storage ? List the advantages of using hermetic storage structures. *8*

(e) Write in brief about : *8*

(i) Woven Mesh type of farm fence

(ii) Seasoning of Timber

Q6. (a) Compute most efficient width for an open ditch/channel with flow depth of 2·40 metres in silt loam soil. What are the velocity and channel capacity, if channel gradient is 0·09 per cent and Manning's roughness coefficient is 0·04 ? The side slope of the channel for silt loam soil can be taken as 1·5 : 1. *15*

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

(c) What are the supplemental structures used in tile drainage system for their successful functioning and long life ? *15*

Q7. (a) A well penetrating aquifer which is underlain and overlain by impermeable layers was tested with a uniform discharge of 1000 litres/min. The steady state drawdowns measured in two observation wells which were at 1·0 m and 10·0 m radial distances from the centre of the pumped well were 13·40 m and 4·20 m, respectively. Determine the hydraulic properties of the aquifer, if its saturated thickness is 10·0 m. *15*

(b) Describe the main hydraulic principles involved in designing of sprinkler irrigation system. *10*

(c) Write short notes on the following : *15*

(i) Functions of Septic Tank

(ii) Brooder Houses

(iii) Surkhi

(iv) Slump Test on Concrete

(v) CAP Storage System

Q8. (a) Discuss the importance of location selection for establishment of a farmstead. What are the facilities to be kept in mind while designing a good farm house ? *15*

(b) What are the different components of silo storage system ? Mention specific advantages of metallic silos over concrete silos. *15*

(c) What is the necessity of controlling environment inside the greenhouse ? Briefly mention different methods to control greenhouse environment. *10*