I.F.S. EXAM-(M) 2018

AGRICULTURAL ENGINEERING

Paper - I

FSI—P—AGRE

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. I 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.

Answers must be written in ENGLISH only.

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.

PSI-P-AGRE

SECTION A

Ql. Answer the following: 8x5=40 What are the different types of runoff? Explain the factors that affect
the runoff in a watershed. 8
What do you understand by biological or vegetative measures in a
watershed ? Describe the measures. 8

What is integrated watershed management approach 7Explain its
different objectives. 8
Define hydrological drought. Write its components and their possible
effects. List the measures that can be adopted to lessen the effects of
drought in a region. 8
Define remote sensing. What are the different stages in remote sensing
data acquisition and processing ? Diagram showing remote sensing
system for resource management from source to end use may be given. 8

Q2. (a) What is GIS ? Name the applications of remote sensing and GIS in land
and water management. Briefly discuss any three applications. 10
Discuss the Rational method of predicting design peak runoff rate.
In a watershed the most remote point is 600 m away from the outlet
point. The outlet point is 3.0 m below the most remote point. Calculate
the time of concentration of watershed. 10

Explain a procedure for checking rainfall data of a station for
consistency. 10

What is contour trench ? Write about different types of contour trenches.
Explain design procedure of contour trench systems. 10

Q3. (a) The ordinates of the 2-h unit hydrograph of a watershed are given
below:

Time, h 0 2 4 6 8 10 12 14 16 18 20 22
2-h UH

ordinates, m3/s 0 20 90 150 180 160 100 60 25 15 5 0

Determine the ordinates of S-curve hydrograph and using S-curve
determine the ordinates of the 4-h unit hydrograph of watershed. 10

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What are the factors which affect soil erosion by water ? Discuss. If the
degree of slope is increased 4 times, what will be the relative increase in
erosion caused by water? /0

Define flood routing. Discuss the basic elements of flood routing. /0

Discuss design procedure of permanent soil conservation structures. /0

Q4. (a) Describe the classification of bench terraces given by Rama Rao and
Bali, with suitable sketches. TO

What are the factors affecting land grading ? How is survey carried out
for land grading ? Discuss commonly used methods for calculation of
earthwork. /0

Discuss in brief the utility of farm ponds. What are the different types of
ponds depending upon the source of water and their location with respect to land surface ? Write the criteria for selection of site of farm
ponds. TO

What are the different types of soil movement due to wind erosion ? Describe how the movements of the particles of various sizes take place
in different types of movement. TO

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SECTION B

Q5. (a) What are the different sources of irrigation in India 9List different factors influencing planning and development of minor irrigation
projects. What are the positive and negative impacts of irrigation on the
ecosystem and environment? 8

(b) Differentiate between the following: 4<2-8

Specific capacity of well and Specific yield of aquifer

Open wells and Tubewells

Pumping test and Recuperation test of a well

Confined and Unconfined aquifers

(c) Discuss various factors influencing irrigation water requirement. How can you estimate total irrigation water requirement incorporating
different components for a given field and crop? 8

(d) The soil moisture at Field Capacity (FC) is 25% (W/W) and the moisture
content at the time of irrigating is 15% (W/VV). The apparent specific
gravity is F52 and depth of soil to be wetted is 90 cm. How much water
in ha-cm per hectare must be applied? 8

(e) What is Parshall flume ? Explain the working procedure of Parshall
flume. How is it different from cut-throat flume? 8

Q6. (a) Explain the concept of conjunctive use of surface and groundwater in canal command areas for efficient water use. What are the advantages
and limitations of conjunctive use? /0

What is the importance of drainage network in canal command and
large irrigation projects 9 List all the information required for design
and installation of subsurface drainage systems. 10

A field of wheat crop of size 200 x 100 m with water source located at the lower left corner in the field is to be irrigated using sprinkler irrigation system. The prevailing land slope is south to north. Draw a layout of
sprinkler mainline and lateral lines with brief explanation. 10

It is very important for a farmstead to be properly arranged. List and explain in brief, the factors to be considered for best arrangement of
farmstead. 10
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Q7. (a) List different soil water coefficients. Explain the methodology to
estimate maximum available soil water using these coefficients. 10

A tubewell is established in an artesian aquifer. Find its yield in litres
per hour for a drawdown of 3 m when the diameter of the well is 20 cm
and the thickness of the aquifer is 30 m. Assume the coefficient of
permeability to be 35 m/day. If the diameter of the well is doubled, find
the increase in the yield, the other conditions remaining the same.
Assume the radius of influence as 300 m in both cases. 10

What is crop coefficient and how is it estimated using crop evapotranspiration and reference evapotranspiration ? Explain briefly
the factors influencing crop coefficient. 10

Irrigation scheduling involves determining "when to irrigate" and "how
much to irrigate". Explain the factors to be considered in developing
irrigation schedule, with an example. 10

Q8. (a) What are the main components of Polyhouse ? Discuss various factors influencing the design and installation of Polyhouses in India for surface
covered cultivation. 10

What are the priorities given to environmental issues in irrigated
commands ? Considering a holistic view of irrigated agriculture and
socio-economic constraints, explain the issues in brief. 10

In an exercise to develop design and operations plan for surface irrigation in wheat crop, an infiltration test was carried out. The following data were obtained from the test:

Time from starting (min) 0 1 2 5 10 20 30 60 90 120

Depth of water level from
reference (mm) 0 3 5 9 14 18 20 24 28 32
Plot the infiltration rate vs time and find out basic infiltration rate. /0

What are the different methods for fertilizer injection (fertigation) ? The location of fertigation systems is very important in drip irrigation
systems. Discuss in brief. 10

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