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Candidate should write his/her Roll No. here.

Total No. of Questions : 03

No. of Printed Pages : 4

M-SFS-I-2017 (16)
AGRICULTURAL ENGINEERING
(Optional Subject)
First Paper

Time : 3 Hours]

[Total Marks : 200

Instructions to the candidates :

1. This question paper consists of **three** questions and all questions are compulsory.
2. Marks for each question have been indicated on the right hand margin.
3. There is no internal choice in Question No. 1, remaining questions carry internal choice.
4. The first question is of very short-answer type consisting of **15** compulsory questions. Each one is to be answered in one or two lines. Question No. 2 is short answer type, word limit is **100**. Question No. 3 is long answer/Essay type, word limit is **300**.
5. Wherever word limit has been given, it must be followed to.
6. Question should be answered exactly in the order same as mentioned in the question paper. Answer to the various parts of the same question should be written together compulsorily and no answer of the other question should be inserted between them.

M-SFS-I-2017 (16)

P.T.O.



Part – A

1. In this section, there are 15 sub parts from A to O of very short answer limited to one or two lines with not exceeding 15 words for each. Each sub part carries 4 marks. 15 × 4 = 60

- (A) Leaching requirement
- (B) Drainage density
- (C) S-curve
- (D) Leaf area index
- (E) Field moisture deficiency
- (F) Shoulder bund
- (G) Cofferdam
- (H) Direct runoff
- (I) Pan coefficient
- (J) Relief
- (K) Effective rainfall hydrograph
- (L) "ODYSSEY"
- (M) Froude number
- (N) Synthetic unit hydrograph
- (O) Water-year

Part – B

2. In this section, there are 10 sub parts from A to J of short answer not exceeding 100 words for each. Each sub part carries 8 marks. 10 × 8 = 80
- (A) What are the contour and graded bunds ? How do they differ in design and functional aspects ?
 - (B) Define remote sensing. Explain in brief the application of remote sensing in agriculture and forestry.

- (C) Show that a trapezoidal channel of bottom width b , depth of flow d and side slope $2 : 1$ ($H : V$) will have best hydraulic section if hydraulic mean radius R is $d/2$.
- (D) Explain the different methods of determining the average rainfall over a watershed due to a storm. Discuss the relative merits and demerits of the various methods.
- (E) Fifteen sprinklers with twin nozzles of 5 mm and 4 mm diameter each with coefficient of discharge 0.96 are operating at 2.5 kg/cm^2 pressure. The sprinkler spacing is $12 \text{ m} \times 16 \text{ m}$. The consumptive use rate for a particular crop is 6 mm per day and irrigation interval is 10 days. Determine the
- Discharge of sprinkler
 - Total capacity of sprinkler system
 - Time of operation of sprinkler system
- (F) Explain the interaction of EMR with the atmosphere.
- (G) What is polyhouse ? Describe the working of fan and pad cooling system with a neat sketch.
- (H) A single acting reciprocating pump has a piston of diameter 10 cm and stroke length 20 cm. The piston makes 40 double strokes per minute. The suction and delivery head are 5 m and 10 m respectively. Find
- The discharge capacity of pump in lit/min;
 - The force required to work the piston during the suction and delivery strokes if the efficiency of motion and delivery strokes are 50 and 60 percent respectively; and
 - The h.p. required by the pump for its operation.

- (I) A flat area is drained by parallel open ditch drains spaced 25 m apart and 300 m long.
- If the drainage coefficient is 4 cm, what will be the flow at the outlet end of each drain ?
 - Design the most economical trapezoidal section when drains are to be laid along a gradient of 1.5 percent and side slopes are to be kept as 1 : 1. Take Manning's n as 0.04.
- (J) A circular concrete silo, having internal diameter of 3 m and clear height of 8 m contains wheat weighing 900 kg m^{-3} . The angle of friction between wheat and wall is 24° . Applying Airy's theory; calculate the maximum lateral pressure at the bottom of bin section.

Part – C

3. In this section, there are 03 sub parts A, B and C of long answer or essay type not exceeding 300 words for each. Each sub part carries 20 marks. $3 \times 20 = 60$

- (A) In a sub surface drainage system, the peak discharge which has to flow through the tile drain when it just flows full is given by

$$Q = 6.715 \times 10^{-4} S^{0.5} n^{-1}$$

Where

Q = Discharge, m^3/s

S = Drain bed slope

n = Manning's roughness coefficient,

Determine the size of the tile drain.

- (B) Write down the assumptions of Hooghoudt's equation for spacing of drains and derive the equation.
- (C) Write universal soil loss equation and explain the different terms. If soil loss by water erosion for a field having a length of 150 m and average slope of 7% is 18 tons/ha. Find the maximum slope length to reduce the soil loss to 9 tons/ha, if length factor exponent is 0.5.