Total No. of Questions : 8]

SEAT No. : ____

PB2233

[Total No. of Pages : 3

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B.E.(civil)
IRRIGATION AND DRAINAGE
(2019 Pattern) (Semester-VIII) (401013 C)(Elective -V)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Answers to the all questions should be written in single answer-book.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume Suitable data if necessary.***

Q1) a) Explain why priming is essential in centrifugal pump. **[6]**

b) Discuss two empirical equations used to estimate head loss in drip irrigation. **[6]**

c) What is the general information required for the design of drip irrigation system? **[6]**

OR

Q2) a) What is the NPSH of centrifugal pump? Distinguish between available NPSH and required NPSH. **[6]**

b) Define following terms related to centrifugal pump: **[6]**

i) Static head, ii) Manometric head,

iii) Delivery head, iv) Gross head,

v) Suction head, vi) Manometric efficiency,

c) Discuss the design procedure for lateral line of drip irrigation system for uniform slope. **[6]**

Q3) a) As per hydraulic design of sprinkler system, explain how to compute: **[8]**

i) Discharge of sprinkler nozzle,

ii) Water spread area of sprinkler,

iii) Break-up of jet,

iv) Water application rate.

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b) A farm of 25 ha is planned to be brought under sprinkler irrigation. The textural class of the soil is loam-to-silt loam, having moisture content at field capacity (FC) and permanent wilting point (WP) of about 42% (by volume), and 26% (by volume), respectively. An infiltration test data showed that the constant (basic) infiltration rate is 2mm/h. A relatively impervious layer exists at a depth of 2.0m below the soil surface.The long-term average reference evapotranspiration (ET_0) rate in that area is 4.5 mm/d. Vegetable crops are planned to grow in the farm, and the crop coefficient (K_c) at the mixiumum vegetative period is 1.1. Determine: **[9]**

i) Maximum evapotranspiration (ET_{max}),

ii) Daily water requirement for the area (assume application efficiency Ea = 80%),

iii) Discharge rate (assume daily irrigation period = 4 hrs),

iv) Discharge rate of individual sprinkler.

OR

Q4) a) Draw a labelled sketch showing components of a sprinkler irrigation system. What are advantages and disadvantages of sprinkler irrigation system. **[5]**

b) Explain following types of sprinkler systems: **[6]**

i) Rotating head system

ii) Perforated pipe system

c) Determine the system capacity for a sprinkler irrigation system to irrigate 30 ha of maize crop. Design moisture use rate is 5 mm per day. Moisture replaced in soil at each irrigation is 7 cm. Irrigation efficiency is 75%. Irrigation period is 11 days in 14 day interval. The system is to be operated for 20 hours per day. **[6]**

Q5) a) Explain in brief-salinity stress coefficient. **[6]**

b) What is sodicity? Explain how to calculate SAR? **[5]**

c) Determine the depth of irrigation water which would change 25 cm depth of loam soil into saline soil condition, if the electrical conductivity of irrigation water is 1.5 millimhos/cm. The bulk density of the soil is 1.21 gm/cc and the density of water is 1gm/cc. The saturation percentage of the soil is 40. **[6]**

OR

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Q6) a) A quantity of 100 ml of gypsum solution, having 25 meq/l concentration as calcium, on reacting with 6.9 gm of an alkali soil showed 32 meq/l of Ca+Mg concentration in the filtrate. Estimate the gypsum requirement in meq/100 gm soil. **[6]**

b) Explain influence of salts on the physical properties of soil. **[5]**

c) What is leaching fraction? Explain how to compute leaching fraction. **[6]**

Q7) a) What are the different steps involved in the drainage design? **[5]**

b) What is land forming in surface drainage? **[5]**

c) Surface drainage should be planned for a new agricultural farm to drain out irrigation tail-water and seasonal rainfall runoff. The maximum rainfall intensity at the site in 35 years record is 41 mm/h. The tertiary drain would have to carry runoff from 4.3 ha land. The secondary drain would have to carry thrice of tertiary, and the main drain to carry discharge of five secondary drains (of similar flow). Determine the design discharge capacity of the (a) tertiary, (b) secondary, and (c) main drain. **[8]**

OR

Q8) a) Enlist different structures in pipe drain system. **[4]**

b) Explain in brief: **[6]**

i) Clay tile pipe,

ii) Concrete pope,

iii) Plastic pipe used for subsurface drainage system.

c) Determine the required drain spacing (L) for the basic design criteria q = 9mm/d, H = 0.65 m, pipe with outer diameter = 0.25 m and wet entry perimeter (u) = 0.35 m. K_1 = 2.0m/day, K_2 =1.0 m/day, W =1m, D = 3m. Refer Fig.8 (c). Use Hooghoudt's formula. Take only two trials. **[8]**

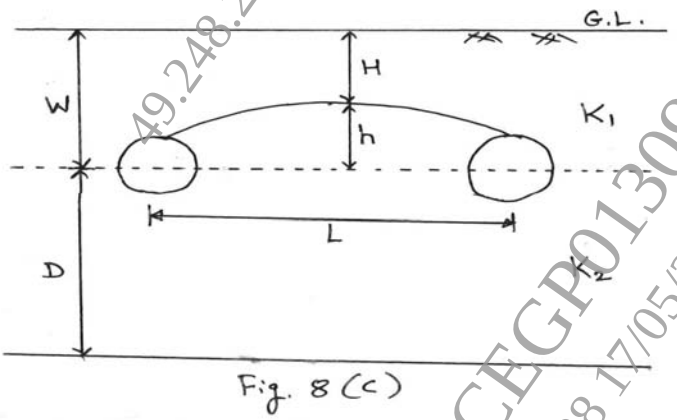

Fig. 8 (c)

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