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ET-533(A)

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B.Tech. Civil (Water Resources Engineering)

Term-End Examination

December, 2013

ET-533(A) : IRRIGATION ENGINEERING

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any five** questions. All questions carry **equal** marks. Support your answer with examples and neat diagrams. Use of calculator is **permitted**. Assume any data suitably, if not given.*

1. Explain the following in brief : **7x2=14**

(a) Threshold salinity level

(b) ϕ - index and w-index

(c) Drip irrigation

(d) sloping bed drop

(e) Leaching

(f) Four corners method

(g) Manometric efficiency of centrifugal pump.

2. (a) Sprinkler nozzles discharging 25 lit/min have a wetted diameter of 30 m are spaced 15 m apart along a lateral. The spacing between the laterals is 18 m. Determine the water application rate of sprinkler nozzle. 7

(b) Explain components of Drip Irrigation system in detail. Also write the advantages and disadvantages of this method. 7

3. (a) Explain any one method for estimation of evapo-transpiration in detail. 7

(b) An isolated 4 - hour storm occurred over a given basin in the following pattern : 7

Zone	% Of Catchment Area	ϕ Index (cm/hr)	Rainfall (cm)			
			1st Hour	2nd Hour	3rd Hour	4th Hour
1	20	1.00	0.8	2.5	3.7	1.8
2	20	0.75	0.7	2.4	3.2	0.8
3	35	0.80	1.5	3.2	4.5	1.0
4	25	0.50	0.8	4.5	3.2	0.8

Estimate runoff from this storm.

4. (a) In an agricultural area, the soil cross - section has an impermeable stratum at about 5 m depth below the ground surface. The average permeability of the soil above this stratum is k = 1.8m/day. The drainable porosity is independently estimated as $0.04/m^3$. A series of drain at a spacing of 60m is set at a depth of 1.35 m below the ground level. The depth of water table after complete charging is 0.3 m below ground level. Estimate the time in days required for the water table to drop by 0.6 m from the original level after the stopping of recharge. 7

(b) What do you mean by land grading and its need. Also, explain the steps involved in landgrading. 7

5. Calculate the dimensions of a centrifugal pump impeller with 7 blades. Suction side is axial, and the discharge is 100 litre/sec at a total head of 40m. Prime mover is electric motor of 1470 rpm, with the pump efficiency of 78%. Assume following data : 14

Shaft diameter = 4.0 cm

Volumetric efficiency = 96%

Velocity coefficient for inlet = 0.157

Velocity coefficient for outlet = 0.120

6. A wet sample of soil of 1875 gm was moulded into 1000 cm3. The soil was dried in an oven reaching a constant mass of 1675 gm. Its specific gravity may be taken as 2.67. Compute the following quantities : **7x2=14**

(a) Water content by weight and volume basis.

(b) Dry unit weight of soil, v_d

(c) Porosity, N

(d) Void ratio

(e) Degree of saturation

(f) Saturated unit weight, r_{sat} and

(g) Air - filled porosity, Na

7. (a) Ten 300 m long laterals with sprinklers in a 15m square spacing pattern are operated simultaneously to irrigate a 25 ha field. The system is designed to deliver a daily irrigation requirement of 15mm. Determine the maximum irrigation interval. **6**

(b) Answer the following in brief : **4x2=8**

(i) What are the factors affecting the functioning of a grader ?

(ii) Why are excavator - loaders very popular equipment ?

(iii) Under what situations will you prefer a dragline over a backhoe ?

(iv) What are the two types of trenching machines ?