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ET-533 (A)

B.Tech. CIVIL (WATER RESOURCES ENGINEERING)

00169

Term-End Examination

June, 2012

ET-533 (A) : IRRIGATION ENGINEERING

Time : 3 Hours *Maximum Marks : 70*

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

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

(a) Rotodynamic pump

(b) Components of a drainage system

(c) Four - corners method

(d) Parshall Flume

(e) Water allocation method

(f) Adverse effects of water logging

(g) Classification of reaches along the course of a river.

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2. (a) Determine the net depth of irrigation required to irrigate a field 1000 m long and 10 m wide from a source supplying water at the rate of 30,000 litres/hour in clay loam soil in the moderate climate. The field capacity of soil is 27%, depth of root zone is 1m, specific gravity of soil is 1.35 and irrigation is started when 50% of the available moisture has been used. Also determine the time required to irrigate the field. 7

(b) Describe drip irrigation method. Also discuss the advantages and disadvantages of this method. 7

3. (a) An experiment conducted on a silty loam soil gives the following data : 7

$F = 3.0$ cm, at $t = 20$ minutes

$F = 9.5$ cm, at $t = 180$ minutes

Obtain the values of S and K for Philip's equation. Forecast the total infiltration, and the rate of infiltration after 6 hours.

(b) Calculate the reference crop evapotranspiration from an area in Chennai, in the month of February, by FAO Penman method. The following data are available. 7

Latitude = 30° N

U_{mean} = 232 km/day

U_{day} = 3 m/s

RH_{max} = 80%

RH_{mean} = 55%

Altitude = 95 m

T_{mean} = 28.5°C

n = 11.50 hours

$$\frac{U_{day}}{U_{night}} = 1.50$$

Additional data

at T = 28.5°C, e_s = 38.90 m - bar

at Latitude 30°N, N = 13.90 hours/day

Ra = 16.7 mm/day

f (T = 28.5) = 16.4

$$f(e_a) = 0.34 - 0.044\sqrt{e_a}$$

$$f\left(n/N\right) = 0.1 + 0.9\frac{n}{N}$$

C_P = 1.01

W = 0.77

4. (a) Discuss the direct method and cascade method to supply irrigation water to check basin. Also discuss the limitations of check basin method of irrigation. 4½

(b) Enumerate and explain the various types of sprinkler systems. 4½

(c) Discuss the case study of Lower Bhavani Project (LB). 5

5. (a) It is required to calculate the effective head and power of drive motor for a centrifugal pump to deliver a discharge of 100 l/s, from a sump to an overhead tank, from the following data. 7

(i) Difference of water levels in the sump and overhead tank = 24.8 m

(ii) Suction lift = 2.8 m

(iii) Delivery head = 22.0 m

(iv) Head loss in suction pipe = 1.06 m

(v) Head loss in delivery pipe line = 5.41 m

(vi) Diameters of suction and delivery pipe = 250 mm

(b) Explain the general design aspects of turbine pumps and also discuss specific speed as well as performance curves. 7

6. (a) Why land grading is needed ? What aspects are considered in land grading design ? 7

(b) The size of a branch pipe at a given location is to be determined, given the following data : 7

Area to be drained by the field

drains = 15 ha

The drainage coefficient = 10mm/day
Factor of safety for design discharge = 1.5
The pipe used is of the corrugated variety, to be laid at a slope of 0.25 percent.

7. Distinguish between *any four* of the following : **4x3½=14**

(a) Non - steady state drainage formula for falling water table and fluctuating water table condition.

(b) Wheel type and endless chain type trenching machines.

(c) Vertical well type drop and vertical rectangular drop

(d) Turbine pump and centrifugal pump.

(e) Field capacity and wilting point

(f) Weather and climate

8. Write short notes on ***any four*** of the following : **4x3½=14**

(a) National water Policy of India

(b) Infittration Indias

(c) Lysimeter

(d) Irrigation efficiencies

(e) Leaching Process

(f) Drainage coefficient