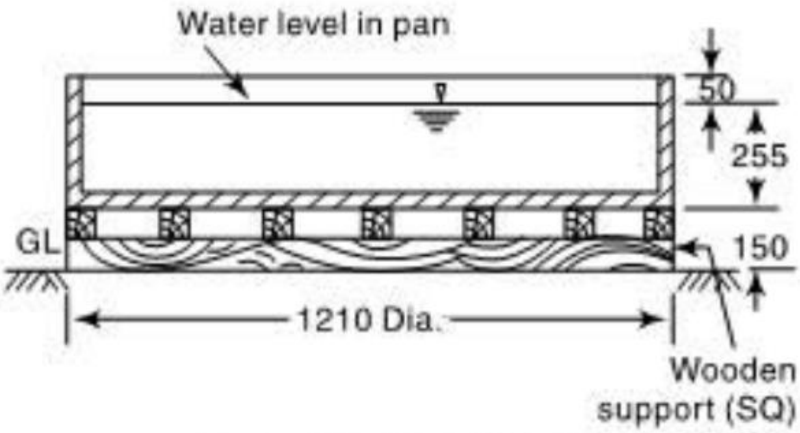
Internal Assessment Test 2
Scheme of Evaluation

Sub:	HYDROLOGY AND IRRIGATION ENGIEERING					Sub Code:	17CV73	Branch	CIVIL
									OBE
							Marks	CO	RBT
1	Explain how evaporation is measured using IS class-A pan? Discuss various factors affecting it						[10]	CO2	L2



U.S. Class A Evaporation Pan

[6M]

Class A pan evaporimeter is 121cm in diameter and 25.5cm deep and is made of Unpainted Galvanised iron [GI]. It is installed 15cm above the Ground level on a wooden frames. The space b/w the wooden frame permits the free circulation of air under the pan. It is filled with water to a depth of 20cm. water surface level is measured daily with a hook gauge in a stilling well. The evaporation is computed as the difference b/w observed water levels.

Annual Pan co-efficient is generally assumed to be 0.7 (also called Land Pan)

Advantages:→
→ Stable Pan Co-Efficient
→ Easy acess for observation
→ More stability compared to floating pan

[4M]

Factors affecting evaporation: The rate of evaporation depends on
1. Vapor pressure at the water surface and air above
2. Air and water temperature
3. Wind speed
4. Atmospheric Pressure

<table>
<tr><td></td><td>5. Quality of water and
6. Size of the water body</td><td></td><td></td><td></td></tr>
<tr><td>2</td><td>The following meteorological data pertain to a large reservoir with water spread area of 15 km^2. The data represents the average values for the day
Water temperature = 24^0C
Air temperature = 26^0C
Atmospheric pressure = 752mm of mercury
Wind speed at 0.5m above G.L = 25.3 km/h
Relative humidity = 46%
Estimate average daily evaporation from the reservoir and evaporation loss from the reservoir for a period of one week using Meyer's and Rohwer's equations.

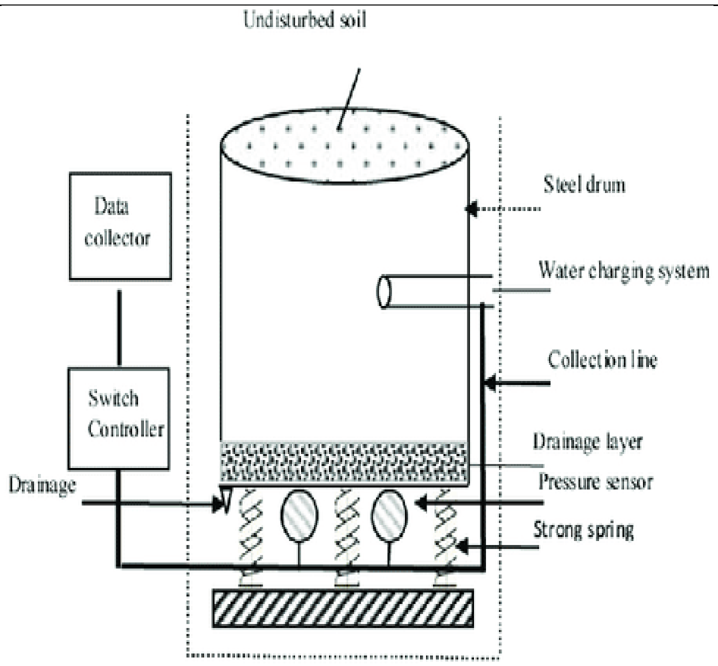
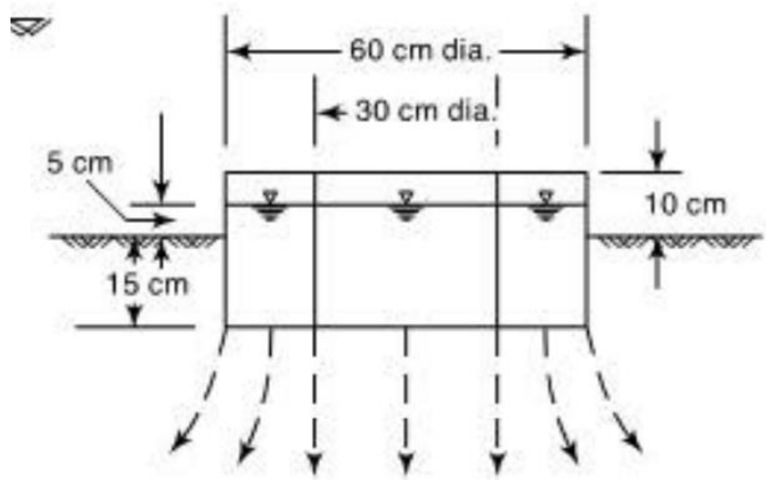
∴ Take e_s corresponding to the water temp of 24° is 22.43 mm of Hg.
e_s corresponding to air tempera-ture of 26° is 25.27 mm of Hg.
Sol:→
Relative humidity = Actual vapour p^r in air / sat. vapour p^r @ air temp
$0.46 = \frac{e_a}{25.27}$
∴ $e_a = 11.62$ mm of Hg.

The velocity at 0.5m above G.L is itself taken to be the mean wind speed at the surface.
i) Meyer's Eq :→
$E_L = K_M [e_s - e_a] \left[1 + \frac{u_9}{16}\right]$
Since it is a large water body consider $K_M = 0.3$.
[Note: The lower part of the atmosphere, up to a ht of about 500m above G.L, the wind velocity can be assumed to follow the expression given by
$u_h = Ch^{1/7}$
where u_h = wind velocity @ a height h above the G.L.
C = constant.]
~~u_h = wind velocity~~
u_9 = wind velocity @ a ht 0.9m above G.L
$u_9 = 25.3 \times (9)^{1/7}$
$u_9 = 34.629$ km/h.
∴ $E_L = 0.3[22.43 - 11.62]\left[1 + \frac{34.629}{16}\right]$
$E_L = 10.26$ mm/day.
E. loss for one week = 7×10.26 = 71.82 mm/week [71.82×10^{-3} × 15×$(10^3)^2$]
= 1.078 ×10^6 m^3</td><td>[10]

2M

4M</td><td>CO2</td><td>L4</td></tr>
</table>

	ii) Rothwer's eqn:→ $E_L = 0.771[1.465 - 0.000732 P_a][0.44 + 0.0733 u_0][e_s - e_a]$ $= 0.771[1.465 - 0.000732 \times 752][0.44 + 0.0733 \times 25.3][22.43 - 21.62]$ $= 17.489$ mm/day. E. for one week $= 7 \times 17.489 \times 10^{-3} \times 15 \times 10^{6}$ $= 1.836 \times 10^{6} m^3$ $= 1.836$ million m^3.	4M		
3	During December at a particular place, the % of sunshine hours is 7.2 and mean temperature is 18^0C. If the consumptive use co-efficient of crop is 0.7 for that month, find the consumptive use or ET of the crop in mm/day by Blaney-Crddle method. Ans:→ Blaney - Criddle method for ET. $ET = 2.54 KF$ and $F = \Sigma Ph \frac{\overline{T_f}}{100}$ Given: $Ph \leftarrow 7.2\%$ $\overline{T_f} \leftarrow 18^\circ C = 64.4^\circ F$ $K : 0.7$ $ET = ?$ mm/day. $\therefore ET = 2.54 \times 0.7 \times \left[\frac{7.2}{100} \times 64.4\right]$ $ET = 8.244$ cm for December month $ET = \left[8.244 \times 10^{-2} / 31\right] \times 1000$ $= 2.65$ mm/day. 10M	[10]	CO2	L3
4	a. What is evapotranspiration? Write its measurements using Lysimeter method, with sketch It is the total water lost from a cropped or irrigated land due to evaporation from the soil and transpiration by the plants. LYSIMETERS A lysimeter is a special watertight tank containing a block of soil and set in a field of growing plants. The plants grown in the lysimeter are the same as in the surrounding field. Evapotranspiration is estimated in terms of the amount of water required to maintain constant moisture conditions within the tank measured either volumetric ally or gravimetrically through an arrangement made in the lysimeter. Lysimeters should be designed to accurately reproduce the soil conditions, moisture content, type and size of the vegetation of the surrounding area. They should be so buried that the soil is at the same level inside and outside the container. Lysimeter studies are time-consuming and expensive.	[10]	CO2	L2

	 b. Describe the method of determining infiltration capacity using double ring infiltro-meter.  eter (b) Double-ring infiltrometer *DOUBLE-RING INFILTROMETER* This most commonly used infiltrometer is designed to overcome the basic objection of the tube infiltrometer, viz. the tube area is not representative of the infiltrating area. In this, two sets of concentrating rings with diameters of 30 cm and 60 cm and of a minimum length of 25 cm, as shown in Fig. 3.12(b), are used. The two rings are inserted into the ground and water is applied into both the rings to maintain a constant depth of about 5.0 cm. The outer ring provides water jacket to the infiltering water from the inner ring and hence prevents the spreading out of the infiltering water of the inner ring. The water depths in the inner and outer rings are kept the same during the observation period. The measurement of the water volume is done on the inner ring only. The experiment is carried out till a constant infiltration rate is obtained. A perforated disc to prevent formation of turbidity and settling of fines on the soil surface is provided on the surface of the soil in the inner ring as well as in the annular space.	5M 5M		
5	a. Explain Horton's infiltration method to estimate infiltration rate	[10]	CO3	L3

HORTON'S EQUATION (1933) Horton expressed the decay of infiltration capacity with time as an exponential decay given by

$$f_p = f_c + (f_0 - f_c)\, e^{-K_h t} \qquad \text{for } 0 \ge t \le t_c \qquad (3.22)$$

where f_p = infiltration capacity at any time t from the start of the rainfall

f_0 = initial infiltration capacity at $t = 0$

f_c = final steady state infiltration capacity occurring at $t = t_c$. Also, f_c is sometimes known as *constant rate* or *ultimate infiltration capacity.*

K_h = Horton's decay coefficient which depends upon soil characteristics and vegetation cover.

The difficulty of determining the variation of the three parameters f_0, f_c and k_h with soil characteristics and antecedent moisture conditions preclude the general use of Eq. (3.22).

5M

b. Explain factors affecting infiltration capacity

The factors affecting infiltration capacity are:

- Characteristics of the soil (Texture, porosity and hydraulic conductivity)
- Condition of the soil surface
- Current moisture content
- Vegetative cover and
- Soil temperature

5M

P. T.O

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