U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

August 2024 Supplementary Examinations

Programme: B.E. **Semester: VI**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 20CV6PCIWR **Max Marks: 100**
Course: Irrigation and Water Resources

Instructions: 1. Answer 5 full questions choosing one full question from units 2 and 5.
2. Assume missing data suitably.
3. Draw neat sketches wherever necessary.
4. Additional normal graph sheets may be supplied.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	CO	PO	Marks
1	a)		List the practical applications of hydrology in engineering.	*CO1*	*PO1*	**5**
	b)		A watershed has a network of five rain gauges. Annual rainfall recorded by these gauges in the year 2020 are given. Calculate the optimum number of rain gauges for this watershed for a 10% error in estimation of mean areal rainfall.	*CO1*	*PO1*	**7**

Rain gauge	A	B	C	D	E
Annual rainfall (cm)	50	82	73	64	105

	c)		For a semiarid watershed in the North Karnataka, the recorded annual precipitation for the years 1996 to 2000 are given. Find the missing rainfall data at station A for the year 1996.	*CO1*	*PO1*	**8**

	Mean annual precipitation (mm)			
Year	Station A	Station B	Station C	Station D
1996	-	576	630	442
1997	1210	1083	1009	951
1998	950	753	905	604
1999	690	675	586	623
2000	860	557	697	803

			UNIT - II			
2	a)		Define infiltration capacity. Explain the factors affecting infiltration capacity. Also, with a neat sketch, explain the procedure of finding the infiltration capacity using the double ring infiltrometer.	*CO2*	*PO1*	**10**
	b)		The following are the ordinates of the hydrograph of flow from a catchment area of 770 km^2 due to a 6 hr rainfall. Derive the ordinates of the 6 hr unit hydrograph. Assume a constant base flow of 40 m^3/s.	*CO2*	*PO2*	**10**

Time from the beginning of the storm (hr.)	0	6	12	18	24	30	36	42	48	54	60	66	72
Discharge (m^3/s)	40	65	215	360	400	350	270	205	145	100	70	50	40

			OR			
	3	a)	A 12 hr storm rainfall occurring over a basin has the following depth in cm for each hour. The surface runoff resulting from the above storm is found to be 24.4 cm. determine the Φ index for the basin. Time (hr.) 1 2 3 4 5 6 7 8 9 10 11 12 Rainfall (cm) 1.8 2.6 7.8 3.9 10.6 5.4 7.8 9.2 6.5 4.4 1.8 1.6	*CO2*	*PO2*	**10**
		b)	A pan evaporimeter is setup near a lake in Bangalore and the following observations are recorded for the 7 days of a week. Day 1 2 3 4 5 6 7 Rainfall (cm) 0 1.6 0.3 0 0.1 0 1.6 Water added to the pan (cm) 0.6 -1.4 0.2 0.7 0.3 0.6 -1.4 i) Determine the daily evaporation and the total pan evaporation during the week ii) Assuming a pan coefficient of 0.7, determine the lake evaporation during the week. Surface area of the lake is 1.2 ha.	*CO2*	*PO1*	**10**
			UNIT - III			
	4	a)	Explain what is meant by stream gauging and list the various methods available for stream gauging. With a neat sketch, explain the area-velocity method of stream gauging.	*CO3*	*PO1*	**10**
		b)	During a high flow, water-surface elevation of a small stream were noted at two sections A and B, 10 km apart. These elevations and other salient hydraulic properties are given. Ignoring the eddy losses, estimate the discharge in the stream. Section | Water-surface elevation (m) | Area of cross-section (m^2) | Hydraulic radius (m) | Remarks A | 104.771 | 73.293 | 2.733 | A is upstream of B B | 104.500 | 93.375 | 3.089 | n = 0.020	*CO3*	*PO1*	**10**
			UNIT - IV			
	5	a)	Discuss the benefits an ill effects of irrigation.	*CO4*	*PO1*	**5**
		b)	With a neat sketch explain the various storage zones in a reservoir and the corresponding water levels.	*CO4*	*PO1*	**7**
		c)	Discuss sprinkler irrigation method, mentioning the method of water application, conditions favoring the adoption of this method and the advantages of the method.	*CO4*	*PO1*	**8**
			UNIT - V			
	6	a)	Define Duty and discuss the methods to improve the Duty.	*CO5*	*PO1*	**5**
		b)	The gross command area for a distributary is 6000 ha, 80% of which is culturable irrigable. The intensity of irrigation for Rabi season is 50% and that for Kharif season is 25 %. If the average duty at the head of the distributory is 2000 ha/cumec for Rabi season and 900 ha/cumec for Kharif season, calculate the	*CO5*	*PO1*	**7**

<table>
<tr><td></td><td></td><td></td><td>discharge required at the head of the distributary from average demand considerations.</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>c)</td><td>Wheat is to be grown in a field having a field capacity 31% and permanent wilting point 15 %.
i) Calculate the storage capacity in 80 cm depth of soil, if the dry unit weight of the soil is 14 kN/m^3.
ii) If the irrigation is to be supplied when the average soil moisture falls to 20%, estimate the water depth required to be supplied to the field.
iii) Also, determine the water needed at the canal inlet if the water lost in the water-course and the field channels is 15% of the discharge at the canal inlet.</td><td>CO5</td><td>PO2</td><td>8</td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>7</td><td>a)</td><td>Define the terms gross command area, culturable command area intensity of irrigation, paleo irrigation, and Kor-watering.</td><td>CO5</td><td>PO1</td><td>5</td></tr>
<tr><td></td><td></td><td>b)</td><td>Discuss various efficiencies generally considered for irrigation water.</td><td>CO5</td><td>PO1</td><td>7</td></tr>
<tr><td></td><td></td><td>c)</td><td>A canal takes off a reservoir to irrigate the areas as given.40% of the water required for irrigation is assumed to be available directly from precipitation. Channel conveyance losses are 15%. Reservoir losses are 10%. Estimate the storage capacity of the reservoir needed, assuming that the reservoir is filled only once a year.
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<tr><th>Crop</th><th>Base period (days)</th><th>Duty at the field (ha/cumec)</th><th>Area under the crop (ha)</th></tr>
<tr><td>Wheat</td><td>120</td><td>1800</td><td>500</td></tr>
<tr><td>Sugarcane</td><td>320</td><td>800</td><td>600</td></tr>
<tr><td>Rice</td><td>120</td><td>900</td><td>300</td></tr>
<tr><td>Cotton</td><td>200</td><td>1400</td><td>1200</td></tr>
<tr><td>Bajra</td><td>100</td><td>1200</td><td>500</td></tr>
</table></td><td>CO5</td><td>PO2</td><td>8</td></tr>
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