OBJECTIVES

This course address the concept of present science of the practice of irrigation engineering which comprising partially all the modern developments which occurs in irrigation purpose. In this mainly the units are taken as metric unit which covers the total area which need for irrigation. In this we can know about water requirement of crops by hydrology, ground water, reservoir water and rain water storing. By this water recourses engineering we can know about design of irrigation structures and planning of reservoir as for flood control

1. To introduce students to the basic concepts of hydrologic cycle and precipitation and its applications
2. Learn how to measure rainwater, Infiltration, evaporation and runoff.
3. To introduce students to the basic concepts of Hydrograph analysis and flood analysis
4. Mathematically finding the unit, S, SUH and synthetic hydrograph.
5. To develop the irrigation through wells, groundwater, rainfall.
6. Necessity and importance of irrigation by its application and some standard methods also.
7. To gain the soil-water for good development of irrigation and estimation on which the total
8. Classification of canals and design of canals by the Kennedy's and lacey's theory.
9. To design the discharge of flood frequency and concepts of hydrologic and reservoir routing.

1. Group - A (Short Answer Questions)

S. No	Questions	Blooms Taxonomy Level	Program Outcome
	UNIT – I **HYDROLOGY , EVAPORATION AND INFILTRATION**		
1	Draw the hydrological cycle?	Understanding	a
2	What are the types of precipitation?	Understanding	a
3	Define Readily available soil moisture?	Understanding	a
4	How can we reduce the water usage?	Understanding Remembering	b
5	Difference between the rainfall and run off?	Evaluate	b
6	What are the factors affecting evaporation?	Understanding	b

S. No	Questions	Blooms Taxonomy Level	Program Outcome
7	How can you measure the infiltration?	Evaluate	b
8	What are the types of infiltration indices?	Remembering	b
9	Define permanent wilting point?	Understanding	b
10	Define rainfall double mass curve?	Understanding Remembering	b
	UNIT- II RUNOFF		
1	Explain hydrograph analysis?	Understanding	c
2	What do you mean by base flow?	Understanding	c
3	What do you understand about flood hydrograph?	Understanding	c
4	Define return period and exceedence probability?	Understanding	d
5	Define Unit hydrograph?	Understanding , remembering	d
6	Define S- hydrograph?	Evaluate	d
7	Define Maximum probable flood?	Evaluate	c
8	Define Design flood?	Understanding , remembering	d
9	Define Annual series?	Remembering	d
10	Define Partial series?	Understanding remembering	d
	UNIT – III GROUND WATER		
1	Define aquifer?	understanding	e
2	What are the different types of aquifers?	understanding	e
3	Define porosity?	understanding	e
4	Define Specific yield?	understanding	e
5	Define specific retention?	Evaluate	e
6	Define Permeability?	understanding	e
7	Define transmissibility?	understanding	e
8	Define Storage coefficient?	Understanding ,remembering	e
9	What are the types of wells?	Understanding , remembering	e
10	Ground water and surface water, Which water is more pure?	Evaluate	e
	UNIT-IV IRRIGATION ENGINEERING & SOIL WATER PLANT RELATIONSHIP		
1	Define Irrigation?	understanding	f
2	What are the different types of soils?	understanding	g
3	What do you understand about full supply coefficient?	understanding	f
4	What are the ill effects of irrigation?	understanding	f
5	What standards required for Irrigation water?	understanding	f
6	Define Duty and Delta?	understanding	f
7	What do you know about the water conveyance efficiency?	understanding	f
8	What do you understand about vertical distribution of soil moisture?	Evaluate	g
9	Define water logging?	Evaluate	f
10	Define field capacity?	Evaluate	g
	UNIT – V		

S. No	Questions	Blooms Taxonomy Level	Program Outcome
	IRRIGATION CANALS AND DESIGN DISCHARGE		
1	What is the difference between the lake and a canal?	Understanding	h
2	Name the two different types of silt theories?	Remembering	h
3	What do you meant by initial and final regime of channels?	Remembering Understanding	h
4	What are the merits of Lacey's theory?	Remembering Understanding	i
5	Why do we need to provide side slopes for canals?	Understanding	h
6	What do you understand about SCS curve?	Understanding Remembering	i
7	What is meant by detention storage and depression storage?	Remembering	h
8	What do you know about Gumbels method of flood frequency anaylasis?	Remembering Understanding	i
9	What is the difference between the silt and scour?	Remembering Understanding	h
10	Which rational formula gives the best results for flood frequency analysis?	Evaluate	i

2. Group - II (Long Answer Questions)

S. No	Questions	Blooms Taxonomy Level	Program Outcome
	UNIT – I **HYDROLOGY , EVAPORATION AND INFILTRATION**		
1	(a)Explain the methods of estimating missing rainfall data at a station in a basin. (b) Explain step by step procedure you would adopt to prepare the depth- area duration curves for a particular storm for a basin having a number of rain-g auges, most of which are recording.	Remembering Understanding	a
2	Explain the following in brief. (a) Isohyet (b) Average Annual Rainfall (c) Probable maximum precipitation (d) Rain gauge density.	Remembering Understanding	a
3	(a)Define water equivalent of snow and explain how you estimate snow melt? (b) Discuss the analysis of rainfall data with respect to time, space, frequency and intensity.	Remembering Understanding	a
4	(a)Explain the balanced equation for precipitation and describe the terms. i. Interception and ii. Depression storage. (b)Describe with the help of neat sketches any three methods of separation of base flow from the hydrograph of runoff (i.e. stream flow hydrograph) indicating the situation under which you advocate them.	Analyse	b

S. No	Questions	Blooms Taxonomy Level	Program Outcome
5	(a) Describe with the help of sketch various forms of soil moisture. Which of these soil moistures is mainly available for utilization by the plants? (b)Write short notes on: (i) Double-mass curve (ii) Cold and warm fronts (iii) Cyclones and anticyclones.	Analyse	b
6	(a)Write short notes on: (i) Pan Co-efficient (ii) ϕ-index (iii) Evaporation opportunity. (b) Evaporation is indirectly a cooling process. Justify the statement. Discuss the factors affecting evaporation.	Creating	b
7	a)Bring out the difference between evaporation, transpiration, evapotranspiration and consumptive use. (b) Discuss the various factors affecting evapotranspiration. (c) Distinguish between the potential evapotranspiration and the actual evapo-transpiration.	Creating	b
8	(a) Discuss the various factors affecting evapotranspiration. (b)Write notes on the following: (i). Permanent Wilting point (ii). Temporary Wilting point (iii). Readily available soil moisture	Analyze	b
9	(a) Explain energy budget method of computing lake evaporation. What are its limitations? (b) What factors are considered while locating a gauge-discharge site?	Remembering Understanding	b
10	(a) Different iate between: infiltration rate and infiltration capacity. (b) Write short notes on: (i)Isochrones (ii)Time of concentration	Analyse	b
	UNIT – II **RUNOFF**		
1	Define unit hydrograph. What are the assumptions underlying the unit hydrogr aph theory. How do they limit the applicability of unit hydrograph?	Understanding	d
2	(a) What does the word unit refer to in the unit hydrograph? Explain with sketches what do you understand by the principle of linearity and principle of time invariance in the unit hydrograph theory? (b) Describe how recession constants of direct runoff and base flow curves are obtained from a semi log arithmetic plot.	evaluate	d
3	Explain the terms: (i)Annual series (ii). Partial duration series (iii). Recurrence interval (iv). Probable maximum precipitation.	Understanding Remembering	c
4	Describe how unit hydrograph can be used to predict the runoff from a storm. What are the uses of unit hydrograph.	Understanding Remembering	d

S. No	Questions	Blooms Taxonomy Level	Program Outcome
5	Describe the method of estimating a Tr -year flood using Gumbel's distr ibution.	analyze	c
6	(a) What are the various components of runoff? Describe how each component is derived in the runoff process. (b) How is runoff estimated using Strange's tables and Barlow's tables	apply	c
7	State the significance of inflection point on recession side of the hydrograph. Also explain the different factors that effect the shape of the hydrograph.	analyze	d
8	(a) Describe the method of deriving unit hydrograph from complex storms . (b) Describe SCS method in detail.	analyze	d
9	Discuss a method to obtain UH from complex storms. What do you under stand by the principle of linearity and time invariance in unit hydrograph?	evaluate	d
10	(a) What do you mean by Antecedent precipitation index? Explain. (b) List out and explain various physiographic factors affecting runoff.	Understanding Remembering	c
	UNIT –III **GROUND WATER.**		
1	Write short notes on: (a) Specific capacity of a well and specific yield of an aquifer (b) Aquifer and acuiclude (c) Open wells and tube wells (d) Water table and artesian aquifers.	Understanding Remembering	e
2	Distinguish between (a) Aquifer and Aquifuge (b) Confined aquifer and water table aquifer (c) Aquiclude and Aquitard (d) Groundwater and Perched groundwater.	Evaluate	e
3	Write notes on the following: i. well losses, ii. Specific capacity of a well, iii. Spherical flow in a well, iv. Interference among wells	Understanding Remembering	e
4	Distinguish between i. Aquifer s and aquicludes ii. Non- ar tesian and artesian wells iii. Perched aquif ers and water table aquifier iv. Permeability and transmissibility.	Analyze	e
5	Differentiate between shallow dug wells and deep dug wells. How the dug well is constructed? Enumerate the methods which are used for determining the yield of dug wells. Discuss briefly any one of these methods.	Evaluate	e
6	(a) Distinguish with sketches if necessary, the difference between unconfined and confined aquifer (b) Derive a formula for discharge of a well in a homogeneous unconfined aquifer assuming equilibrium flow condition. State the	Evaluate	e

S. No	Questions	Blooms Taxonomy Level	Program Outcome
	assumptions on which the for mula is based.		
7	(a) Distinguish between: i. Vadose zone and phreatic zone ii. Aquiclude and Aquitard iii. Transmissivity and storativity	Understanding Remembering	e
8	Define and explain the following terms as used in connection with ground water i. Capillary fringe, ii. Specific yeild, iii. Pellecular water, iv . Field capacity	Remembering &Evaluate	e
9	Write notes on the following: i. Capillary water , ii. Hygroscopic water iii. Gravitational water	Understanding	e
10	Define outlet factor, capacity factor, full supply coefficient and root zone depth.	Understanding	e
	UNIT – IV **IRRIGATION ENGINEERING & SOIL WATER PLANT RELATIONSHIP**		
1	Discuss various methods of irrigation and state the advantages of each method.	Understanding	f
2	(a) Discuss in brief, various methods of surface irrigation. (b) Describe the step by step procedure for preparation of land for irrigation	Understanding Remembering	f
3	(a) What is meant by C2-S2 water?. Discuss its usefulness for irrigating fine textured soils. (b) Write short notes on: i. Applicability of lift irrigation ii. Mixed cropping iii. Il-effects of irrigation	Evaluate	f
4	(a) What is meant by Furrow irrigation and Sprinkler irrigation? Which one is preferred in India and Why. (b) What is meant by `Border flooding' How does it differ from `Check flooding' and `free flooding'?	Understanding Remembering	f
5	(a) Define Irrigation. What is the necessity of irrigation? (b) Describe in brief some of the important irrigation projects and multipurpose river valley projects under taken or completed after independence of our countr y.	Evaluate	f
6	(a) What is meant by flow duty and quantity duty? (b)Ex plain as how the following factors effect the duty of a crop. i. soil and sub soil condition ii. Stage of growth iii. Temperature iv. Rainfall	Understanding	f
7	(a) Define the terms Duty, Delta and base period and also derive the relation between them. (b) Explain the following terms:	Understanding	f

S. No	Questions	Blooms Taxonomy Level	Program Outcome
	i. Field capacity ii. Moisture equivalent iii. Available moisture.		
8	(a) Define irrigation efficiency. List out different types of irrigation efficiencies. Explain any two of them. (b) Define Consumptive use of water? List out various methods used for the assessment of consumptive use of water? Explain any one method in detail for the estimation of consumptive use	Understanding	f
9	(a) Why soil is necessary for plant life. Explain the classification of soils based on geological process of formation. b) Write down the classification of irrigation water based on sodium absorption ratio and its suitability for irrigation.	Understanding	g
10	What is meant by duty and delta of canal water? Derive a relation between duty and delta for a given base period.	Analyze	g
	UNIT – V **IRRIGATION CANALS AND DESIGN DISCHARGE**		
1	(a) Write short notes on the following : i. free boarding in canals ii. Permanent land width iii. Inspection road iv. Berm (b) Write down the classification of canals. Explain canal alignment.	Analyze	h
2	(a) Why is Lacey's conception is superior to that of Kennedy's? (b) What do you understand by i. regime channels ii. Initial and final regime of channels?	Evaluate	i
3	(a) When do you classify the channel as having attained regime condition? (b) Describe briefly the observations of Lacey on the regime of river.	Evaluate	i
4	(a) Discuss critically the statement "The bank s of an unlined channel are more Susceptible to erosion than its bed, and hence the stability of the bank s and not of its bed is the governing factor in unlined canal designs". (b) Explain the following terms in detail. i. Ridge canal ii. Side slope canal	Evaluate	h
5	(a) What is the necessity of drainage below the lining? Discuss the various drainage and pressure release arrangements. (b) Using Lacey's basic regime equations derive an expression for Lacey's scour depth.	Analyze	i
6	What is meant by scour? What precautions do you take against it during the design of weirs?	Analyze	h
7	Explain the mid-section method of computing the discharge in a stream. Show in a neat sketch, the positions of velocity measurements over the cross sectional area of the stream.	Analyze	i
8	Draw a typical cross section of a barrage founded on pervious foundations and ex plain its salient features.	Analyze	h

S. No	Questions	Blooms Taxonomy Level	Program Outcome
9	(a) What do you understand by critical gradient. What will happen if the critical gradient is exceeded? What is Khosla s safe exit gradient? (b) Explain how Khoslas theory is modification over Bligh's theory.	Analyze	i
10	Distinguish between: i. Overland flow and interflow ii. Influent and effluent streams iii. Detention storage and depression storage iv. Drainage density and drainage divide.	Remembering	h

3. Group - III (Analytical Questions)

S. No	Questions	Blooms Taxonomy Level	Program Outcome
	UNIT – I **HYDROLOGY , EVAPORATION AND INFILTRATION**		
1	A basin has the area in the form of a pentagon with each side of length 20Km. The five raingauges loc ted at the corners A, B, C, D and E have recorded 60, 81, 73, 59 and 45 mm of rainfall respectively. Compute average depth of rainfall over the basin using arithmetic mean and Theissen polygon methods.	evaluate	a
2	The annual rainfalls at 7 raingauge stations in a basin are 58, 94, 60, 45, 20, 88 and 68cm respectively. What is the percentage accuracy of the existing network in the estimation of average depth of rainfall over the basin. How many addit ional gauges are required, if it is desired to limit the error to only 10%.	evaluate	a
3	The following information is available at a gauging site River A: Data Length 80 Years; Mean of the Flood (m3/sec) 6200; Standard deviation (m3/sec) 2850.0 River B: Data Length 50 Years; Mean of the Flood (m3/sec) 5400; Standard deviation (m3/sec) 3210.0 Estimate 200 year and 500 year floods for the two rivers using Gumbel's method.	evaluate	a
4	An outlet is to be designed for a town covering 25 km2 , of which road area is 30%, residential area 40% and rest industrial area. The slope of the catchment is 0.004 and maximum length of the town measured in map is 3 km. From depth duration analysis the following information is obtained. Rainfall Duration (min) 30 45 60 Rainfall Depth (mm) 15 20 30 Calculate the peak discharge. The coefficients for road is 0.80, residential area 0.40 and industrial area is 0.20.	Apply	b
5	The ordinates of a 4-hour unit hydrograph are given below. Derive the ordinates of a 8-hour unit hydrograph by the S-curve method. Time (hr): 0 — 4-hr UGO (Cumec): 0 — Time (hr): 24 — 4-hr UGO (cumec): 103	Creating	b

<table>
<tr><th>S. No</th><th>Questions</th><th>Blooms Taxonomy Level</th><th>Program Outcome</th></tr>
<tr><td></td><td>
4 24 28 64
8 82 32 36
12 159 36 17
16 184 40 6
20 151 44 0
</td><td></td><td></td></tr>
<tr><td>6</td><td>What are the factors which affect infiltration? Explain any one method of determining the infiltration capacity of soil surface.
<table>
<tr><th>Dates</th><th>Consumptive use in mm</th><th>Effective rain fall in mm</th></tr>
<tr><td>October 16-31</td><td>37</td><td>20.8</td></tr>
<tr><td>November 1-30</td><td>94.2</td><td>10.4</td></tr>
<tr><td>December 1-31</td><td>124.9</td><td>6.7</td></tr>
<tr><td>January 1-31</td><td>168.1</td><td>2.4</td></tr>
<tr><td>February 1-2</td><td>13.3</td><td>1.0</td></tr>
</table></td><td>Analyze</td><td>a</td></tr>
<tr><td>7</td><td>The average rainfall over 45 ha of watershed for a particular storm was as follows: The volume of runoff from this storm was determined as 2.25 ha-m. Establish the ϕ-index.
<table>
<tr><td>Time (hr) :</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>Rainfall(cm) :</td><td>0</td><td>0.5</td><td>1.0</td><td>3.25</td><td>2.5</td><td>1.5</td><td>0.5</td><td>0</td></tr>
</table></td><td>Evaluate</td><td>a</td></tr>
<tr><td>8</td><td>The average rainfall over 45 ha of water shed for a particular storm was as follows:
<table>
<tr><td>Time (hr) :</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>Rainfall(cm) :</td><td>0</td><td>0.5</td><td>1.0</td><td>3.25</td><td>2.5</td><td>1.5</td><td>0.5</td><td>0</td></tr>
</table>
The volume of runoff from this storm was determined as 2.25 ha -m. Establish the φ-index</td><td>Analyze</td><td>a</td></tr>
<tr><td>9</td><td>Cumulative rainfall during a storm are:
Time (h)
0 1 2 3 4 5 6 7 8
Rainfall (mm)
0 7 16 22 32 40 52 68 70
Assume an initial abstraction loss of 10 mm and a constant infiltration loss rate of 5.0 mm/ h. Calculate the storm runoff volume from the catchment of 122 sq. km.</td><td>Evaluate</td><td>a</td></tr>
<tr><td>10</td><td>The rate of rainfall for the successive 30 min period of a 3-hour storm is: 1.6, 3.6, 5.0, 2.8, 2.2, 1.0 cm/hr. The corresponding surface runoff is estimated to be 3.6 cm. Establish the φ-index. Also determine the W -index.</td><td>Analyze</td><td>a</td></tr>
<tr><td colspan="4">UNIT – II</td></tr>
<tr><td>1</td><td>A drainage basin has the following characteristics. Basin area = 2500 sq. km. Length of the main stream L = 110 km
Distanc e from the centroid of the basin to outlet = 7 0 k m.
Constuct the 4 hour synthetic unit hydrograph for the basin if Ct = 1 .5 0 and Cp = 0 .6</td><td>evaluate</td><td>c</td></tr>
<tr><td>2</td><td>A 4h hydrograph for a project site in Mahanadi Basin is given below. Calculate 2 -h UH by S-hydrograph approach.</td><td>Creating</td><td>c</td></tr>
</table>

S. No	Questions	Blooms Taxonomy Level	Program Outcome
	Time (h) 0 2 4 6 8 10 12 14 16 18 20 22 24 26 UH ordinates 0 30 10 17 21 18 12 80 40 35 68 20 15 50 (m3 / sec)		
3	For a river reach K is 28 h and X is 0.25. Route the following inflow hydrograph. Take O1 = I1 for the beginning step. Determine the values of attenuation and translation of the peak. Time (h) 0 0 6 12 18 24 30 36 42 48 54 Inflow (m^3/sec) 30 62 242 170 114 78 56 44 38 34 30	Creating	c
4	Compute the runoff volume from a catchment of 120 Sq.km from the following data. Use Khoshla's method and assume that the area belong to Andhra Pradesh. Months Jan Feb Mar Apr May June Rainfall (mm) 8.5 10 6 50 34 150 Temp ^{0}C 24 26 35 38 36 32 Months July Aug Sept Oct Nov Dec Rainfall(mm) 180 220 110 80 50 15 Temp ^{0}C 30 31 27 23 21 20	understanding	d
5	The peak discharge and time to peak in a 3 h unit hydrograph derived for a basin of area 250 km2 with L = 30 km and Lc = 14 km are 50m3 /s and 9 h respectively. Assuming that Snyder's synthetic unit hydrograph applies determine the coefficient Ct and Cp. Determine the 2 h unit hydrograph for the upper 180 km2 of the same watershed which has L= 20km and Lc = 11.8 km.	apply	c
6	A drainage basin has an area of 3800 km2. Determine : i. lag period ii. Peak discharge iii. Base period of a 9-hour unit hydrograph from the following data: L = 320 km, L_{ca} = 200km, C_t = 0.9, C_p = 4.0.	remembering	c
7	A water shed of 3130 sq. km was subjected to a storm of 4 hr duration from which the following are recorded. Time (h) 3 6 9 12 15 18 21 24 3 Discharge (cumecs) 20 16 175 270 230 200 170 150 130 1 Obtain an UH for the watershed	evaluate	c
8	A 4h hydrograph for a project site in Mahanadi Basin is given below. Calculate 2 -h UH by S-hydrograph approach. Time (h) 0 2 4 6 8 10 12 14 16 18 20 22 24 26 UH ordinates (m^3/sec) 0 30 110 170 210 180 120 80 40 35 20 15 5 0	evaluate	d
9	A Flood of 1000cumec exceeded 60 times during a period of 30years. A flood of 3500 cumes exceeded twice.Determine the annual probability and average recurrence interval for both the floods.	apply	d
10	The ordinates of a 12- hr unit hydrograph are given below. Compute a	Creating	d

<table>
<tr><th>S. No</th><th>Questions</th><th>Blooms Taxonomy Level</th><th>Program Outcome</th></tr>
<tr><td></td><td>6- hour unit hydrograph ordinates.
Time (h) 0 6 12 18 24 30 36 42 48 54 60 66 72
12-hr UGO (cumec) 0 1 4 8 16 19 15 12 8 5 3 2 1</td><td></td><td></td></tr>
<tr><td colspan="4">UNIT-III
GROUND WATER</td></tr>
<tr><td>1</td><td>A Flood of 1000 cumec exceeded 60 times during a period of 30years. A flood of 3500 cumes exceeded twice. Determine the annual probability and average recurrence interval for both the floods</td><td>Evaluate</td><td>e</td></tr>
<tr><td>2</td><td>Design a tube well for the following data :
Yield required = 0.2 cumec
Thickness of confined aquifer =40 m
Radius of circle of influence = 30 0m
Permeability coefficient =80m/ day
Drawdown= 6m</td><td>Remembering & evaluate</td><td>e</td></tr>
<tr><td>3</td><td>The following data are observed in a stream by a Price current meter.
<table>
<tr><td>Distance from bank (m)</td><td>0</td><td>3</td><td>5</td><td>7</td><td>9</td><td>12</td></tr>
<tr><td>Depth (m)</td><td>0</td><td>0.6</td><td>1.2</td><td>2.05</td><td>2.35</td><td>2.1</td></tr>
<tr><td>No.of Revolutions at 0.6d</td><td>0</td><td>90</td><td>95</td><td>135</td><td>142</td><td>125</td></tr>
<tr><td>Time Seconds</td><td>0</td><td>184</td><td>125</td><td>125</td><td>125</td><td>125</td></tr>
<tr><td>Distance from bank (m)</td><td>15</td><td>18</td><td>21</td><td>23</td><td>25</td><td>27</td></tr>
<tr><td>Depth (m)</td><td>1.90</td><td>1.6</td><td>1.4</td><td>1.0</td><td>0.4</td><td>0</td></tr>
<tr><td>No.of Revolutions at 0.6d</td><td>115</td><td>110</td><td>95</td><td>90</td><td>76</td><td>0</td></tr>
<tr><td>Time Seconds</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>0</td></tr>
</table>
The current meter rating equation is given as V = 0.33 + 0.03N m/sec. where N is No. of Revolutions per second. Calculate the river discharge</td><td>Evaluate</td><td>e</td></tr>
<tr><td>4</td><td>A well with a radius of 0.5m penetrates completely a confined aquifer of thickness 40 m and permeability 30m /day. The well is pumped so that the water level in the well remains at 7.5m below the original piezometric surface. Assuming that the radius of influence is 500m compute the steady state discharge from the well</td><td>evaluate</td><td>e</td></tr>
<tr><td>5</td><td>A 20 cm well penetrates 30 m below static water level. After a long period of pumping at a rate of 1800 lpm, the drawdowns in the observation wells at 12 m and 36 m from the pumped well are 1.2 m and 0.5 m respectively. Determine the
i. Transmissibility of the aquifer
ii Drawdown in the pumped well assuming radius of influence as 300 m
iii. Specific capacity of the well.</td><td>Analyze</td><td>e</td></tr>
<tr><td>6</td><td>A tube well of 30m diameter penetrates fully in an artesian aquifer. The strainer length is 15 m. Calculate the yield from the well under a drawdown of 3 m. The aquifer consists of sand of effective size of 0.2 mm having coefficient of permeability equal to 50 m/day. Assume radius of influence is equal to 150 meters</td><td>Evaluate</td><td>e</td></tr>
<tr><td>7</td><td>A loam soil has field capacity of 22% and wilting coefficient of 10 %. The dry unit weight of soil is 1.5 g/cm 3. If the root zone depth is 70 cm, deter mine the storage capacity of the soil. Irrigation water is applied if the moisture content falls to 14%. If the water application efficiency is 75 %, determine the water depth req uired to be applied</td><td>Evaluate</td><td>e</td></tr>
</table>

S. No	Questions	Blooms Taxonomy Level	Program Outcome
	in the field		
8	The CCA for a distributory is 15000 ha. The intensity of irrigation is 40% for rabi and 10% for rice. If kor period is 4 weeks for rabi and 2.5 weeks for rice, determine the outlet discharge. Outlet factor for rabi and rice may be assumed as 1800 ha /m3 / sec and 775 ha /m3 / sec. What is design discharge of distributory head at 10% conveyance	Evaluate	e
9	During a recuperation test, the water in an open well was depressed by pumping by 2.5 meters and it recuperated 1 .8 meters in 0 minutes. Find i. Yield from a well of 4m diameter under a depression head of 3 meters, ii. The diameter of the well to yeild 8 litrers/second under a depression head of 2 meters.	Understanding	e
10	An unconfined aquifer has an area extent of 15km2. When 9.5 million cubic metres of water was pumped out, the water table was observed to go down by 2.4m. What is the specific yield of the aquifer? If the water table of the same aquifer rises by 12.5 m during a monsoon season, what is the volume of recharge?	Evaluate	e
	UNIT-IV **IRRIGATION ENGINEERING & SOIL WATER PLANT RELATIONSHIP**		
1	Determine the storage capacity of soil from the following data: Field Capacity = 30% Wilting point = 14% Depth of Root zone = 1.20 m Dry Unit weight of soil = 1.7 g/cc Also determine the depth of water required in the field if irrigation water is supplied when the moisture content falls to 20% and the field application efficiency is 80%. If the conveyance losses in the water courses and field channels are 16% of the outlet discharge, calculate the depth of water needed at the canal outlet.	Understanding	g
2	What is the classification of irrigation water having the following characteristics? Concentration of Na , Ca and Mg are 22 ,3 and 2.5 milli-equivalents per liter respectively and the electrical conductivity is 200 micro mhos percm at 250C ? What problems may rise in using this water on fine textured soils? What remedies do you suggest to overcome this trouble?	Apply	f
3	A watercourse has a culturable command area of 1200 ha. The intensity of irrigation for crop A is 40% and for B is 35%, both the crops being Rabi crops. Crop A has a kor period of 20 days and crop B has a kor period of 15 days. Calculate the discharge of the watercourse if the depth for crop A is 10 cm and for B is 16 cm.	Apply	f
4	An outlet has 600 ha, out of which only 75% is cultivable. The intensity of irrigation for Rabi and Kharief seasons are 70% and 30% respectively. Assuming losses in conveyance system as 10% of the outlet discharge, determine the discharge at the head of the irrigation channel. Take outlet discharge factor for Rabi season as 1500 ha/cumecs and for Kharief season as 750 ha/cumecs.	Remembering	f
5	Determine the storage capacity of soil from the following data: Field Capacity = 30%	Creating	g

<table>
<tr><th>S. No</th><th>Questions</th><th>Blooms Taxonomy Level</th><th>Program Outcome</th></tr>
<tr><td></td><td>Wilting point = 14%
Depth of Root zone = 1.20 m
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Also determine the depth of water required in the field if irrigation water is supplied when the moisture content falls to 20% and the field application efficiency is 80%. If the conveyance losses in the water courses and field channels are 16% of the outlet discharge, calculate the depth of water needed at the canal outlet.</td><td></td><td></td></tr>
<tr><td>6</td><td>After how many days the farmer should apply water to his field to ensure efficient use of irrigation water, if the field capacity is 27%, permanent wilting point is 14%, density of soil is 1500 kg/m3, effective root zone depth 0.75 m and daily consumptive use of water is 11 mm.</td><td>creating</td><td>g</td></tr>
<tr><td>7</td><td>In a certain area paddy crop requires 14 cm of depth of water at an interval of 10 days for a base period of 110 days; Whereas wheat crop requires 9.0 cm of depth of water after 35 days with a base period of 140 days. Determine the delta of paddy crop and duty of wheat crop of that area.</td><td>remembering</td><td>g</td></tr>
<tr><td>8</td><td>800 m3 of water is applied to a farmer's rice field of 0.6 hectares. When the moisture content in the soil falls to 40% of the available water between the field capacity of 36% of soil and permanent wilting point is 15% of the soil crop combination, determine the filed application efficiency. The root zone depth of rice is 60cm. Assume porosity as 0.4.</td><td>remembering</td><td>f</td></tr>
<tr><td>9</td><td>The base period of Paddy is 120 days. If the duty for this is 900 hectares/cumecs. find the value of delta.</td><td>remembering</td><td>f</td></tr>
<tr><td>10</td><td>The base period, the intensity of irrigation and duty of various crops under a canal system are given in the table below. Find the reservoir capacity, if the canal losses are 23% and reservoir losses are 15 %.
<table>
<tr><th>Crop</th><th>Base period (days)</th><th>Duty at the field(ha/cumecs)</th><th>Area under the crop(ha)</th></tr>
<tr><td>Wheat</td><td>120</td><td>1800</td><td>4500</td></tr>
<tr><td>Sugarcane</td><td>360</td><td>800</td><td>5400</td></tr>
<tr><td>Cotton</td><td>200</td><td>1400</td><td>2200</td></tr>
<tr><td>Rice</td><td>120</td><td>900</td><td>2200</td></tr>
<tr><td>Vegetables</td><td>120</td><td>700</td><td>1800</td></tr>
</table></td><td>apply</td><td>f</td></tr>
<tr><td colspan="4">UNIT –V
IRRIGATION CANALS AND DESIGN DISCHARGE</td></tr>
<tr><td>1</td><td>Design a trapezoidal shaped concrete lined channel to carry a discharge of 100 cumecs at a slope of 25 cm/ km. The side slopes of the channel are 1.5:1. The value of N may be taken as 0.016. Assume the limiting velocity as 1.5 m/sec</td><td>creating</td><td>h</td></tr>
<tr><td>2</td><td>Design a trapezoidal shaped concrete lined channel to carry a discharge of 100 cumecs at a slope of 25 cm/km. The side slopes of the channel are 1.5:1. The value of N may be taken as 0.016. Assume the limiting velocity as 1.5m/sec.</td><td>evaluate</td><td>h</td></tr>
<tr><td>3</td><td>Design an irrigation channel section for the following data.
Discharge= 40 cumecs,</td><td>evaluate</td><td>h</td></tr>
</table>

S. No	Questions	Blooms Taxonomy Level	Program Outcome
	Silt factor=1.0, Side slopes= ½: 1 Determine the longitudinal slope also		
4	Design a channel section by Kennedy 's theory given the following data: Discharg e Q =2828 cumecs Kut ter 's N=0 .0225 Critical velocity ratio 'm' =1 Side slop e = 1/2 : 1 B/ D = 7 .6 Find also the bed slop e of the channel.	apply	h
5	Using Lacey 's theory, design an irrigation channel for the following data . Discharge Q= 50 cumecs , Silt factor 'f '=1 .0, Side slopes:1 /2 :1	apply	h
6	Mean and standard deviation from annual peak of a river covering 80 years of data are 4100 m3/sec and 1600 m3/sec respectively. Using Gumbel's method, calculate the return period of the flood of 9100 m3/sec.	evaluate	h
7	From the historical data of annual flood peaks of a catchment, the mean and standard deviation are estimated as 20000m3/s and 10000 m^3/s. An existing structure on this catchment has been designed for 40000m3/sec. What could be its return period? Assume Gumbel's extreme value distribution with nσ = 1.06 and ny = 0.52.	Apply	h
8	From the analysis of available data on annual flood peaks of a small stream for a period of 35 years, the 50 year and 100 year flood have been estimated to be 660 m3 / sec a nd 740 m3 / sec; using Gumbles metho d, estimate 200 year flood for the stream. Take σn = 1 .12 84 7, y_n = 0 .54034.	evaluate	i
9	The slope of channel in alluvium is S= 1/5000 Lacey's silt factor=0.9. channel side slope= 1/2 :1 Find the channel section and maximum discharge, which can be allowed to flow in it	evaluate	i
10	The following data has been obtained while gauging a stream. Main gauge reading (m) = 20.10 20.10 Auxiliary gauge reading (m) = 19.82 19.13 Discharge (cumecs) = 5.40 9.35 Calculate discharge when the main gauge is 20.10 m and Auxiliary gauge is 19.52 m.	evaluate	h