



INSTITUTE OF AERONAUTICAL ENGINEERING

Dundigal, Hyderabad - 500 043

CIVIL ENGINEERING

ASSIGNMENT QUESTIONS

Course Name	:	WATER RESOURCE ENGINEERING - I
Course Code	:	A50122
Class	:	III-I - B. Tech
Branch	:	CIVIL ENGINEERING
Year	:	2017 – 2018
Course Faculty	:	Dr. G. V. Ramana, Professor, Department of Civil Engineering Ms. B. Navya, Assistant Professor, Department of Civil Engineering

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

S. No.	Question	Blooms Taxonomy Level	Course Outcomes
UNIT-I HYDROLOGY , EVAPORATION AND INFILTRATION			
1	(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	Understand	1
2	(a) Differentiate between: infiltration rate and infiltration capacity. (b) Write short notes on: (i) Isochrones (ii) Time of concentration	Understand	2
3.	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 evapotranspiration.	Remember	2
4.	(a) Describe with the help of sketch various forms of soil	Understand	2

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	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.		
5	(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.	Understand & Remember	2
6	A basin has the area in the form of a pentagon with each side of length 20Km. The five raingauges located 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 Thiessen polygon methods.	Remember	1
7	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.	Understand & Remember	1
8	The average rainfall over 45 ha of water shed for a particular storm was as follows: Time(hr) 0 1 2 3 4 5 6 7 Rainfall(cm) 0 0.5 1.0 3.25 2.5 1.5 0.5 0 The volume of runoff from this storm was determined as 2.25 ha -m. Establish the ϕ -index	Understand & Remember	1
9	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 additional gauges are required, if it is desired to limit the error to only 10%.	Remember	1
10	An outlet is to be designed for a town covering 25 km ² , 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.	Understand & Remember	2

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UNIT – II RUNOFF			
1	Define unit hydrograph. What are the assumptions underlying the unit hydrograph theory. How do they limit the applicability of unit hydrograph?	Understand	4
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.	Remember	4
3	Explain the terms: (i) Annual series (ii). Partial duration series (iii). Recurrence interval (iv). Probable maximum precipitation.	Understand & Remember	3
4	Describe how unit hydrograph can be used to predict the runoff from a storm. What are the uses of unit hydrograph?	Understand & Remember	4
5	(a) Describe the method of deriving unit hydrograph from complex storms. (b) Describe SCS method in detail.	Understand	4
6	Discuss a method to obtain UH from complex storms. What do you understand by the principle of linearity and time invariance in unit hydrograph?	Remember	4
7	A drainage basin has an area of 3800 km ² . Determine : i. lag period ii. Peak discharge iii. Base period of a 9-hour unit hydrograph from the following data: $L = 320$ km, $L_{ca} = 200$ km, $C_t = 0.9$, $C_p = 4.0$.	Remember	3
8	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 27 Discharge 20 16 175 270 230 200 170 150 130 (cumecs) Obtain an UH for the watershed	Remember	3
9	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 UH ordinates 0 30 110 170 210 180 120 (m ³ /sec)	Remember	4
10	A drainage basin has the following characteristics. Basin area = 2500 sq. km. Length of the main stream $L = 110$ km Distance from the centroid of the basin to outlet = 70 km. Construct the 4 hour synthetic unit hydrograph for the basin if $C_t = 1.50$ and $C_p = 0.6$	Remember	3

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UNIT – III GROUND WATER.			
1	Distinguish between (a) Aquifer and Aquifuge (b) Confined aquifer and water table aquifer (c) Aquiclude and Aquitard (d) Groundwater and Perched groundwater.	Remember	5
2	Write notes on the following: i. well losses, ii. Specific capacity of a well, iii. Spherical flow in a well, iv. Interference among wells	Understand & Remember	5
3	Define and explain the following terms as used in connection with ground water i. Capillary fringe, ii. Specific yield, iii. Pore water, iv. Field capacity	Remember & Remember	5
4	Write notes on the following: i. Capillary water, ii. Hygroscopic water iii. Gravitational water	Understand	5
5	Define outlet factor, capacity factor, full supply coefficient and root zone depth.	Understand	5
6	Write short notes on: (a) Specific capacity of a well and specific yield of an aquifer (b) Aquifer and aquiclude (c) Open wells and tube wells (d) Water table and artesian aquifers.	Understand & Remember	5
7	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	Remember	5
8	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, determine 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 required to be applied in the field	Remember	5
9	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 /m ³ / sec and 775 ha /m ³ / sec. What is design discharge of distributory head at 10% conveyance	Remember	5
10	During a recuperation test, the water in an open well was	Understand	5

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	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 yield 8 liters/second under a depression head of 2 meters.		
UNIT-IV IRRIGATION ENGINEERING & SOIL WATER PLANT RELATIONSHIP			
1	(a) Discuss in brief, various methods of surface irrigation. (b) Describe the step by step procedure for preparation of land for irrigation	Understand & Remember	6
2	(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	Remember	6
3	(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'?	Understand & Remember	6
4	(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	Understand	6
5	(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.	Understand	7
6	What is meant by duty and delta of canal water? Derive a relation between duty and delta for a given base period.	Understand	7
7	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 per cm at 25°C? What problems may arise in using this water on fine textured soils? What remedies do you suggest to overcome this trouble?	Understand	6
8	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.	Understand	6
9	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	Remember	6

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	ha/cumecs.		
10	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.	Understand	7
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.	Understand	8
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?	Remember	9
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.	Remember	9
4	Draw a typical cross section of a barrage founded on pervious foundations and explain its salient features.	Understand	8
5	(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 Khosla's theory is modification over Bligh's theory.	Understand	9
6	Distinguish between: i. Overland flow and interflow ii. Influent and effluent streams iii. Detention storage and depression storage iv. Drainage density and drainage divide.	Remember	8
7	Design an irrigation channel section for the following data. Discharge= 40 cumecs, Silt factor=1.0, Side slopes= 1/2: 1 Determine the longitudinal slope also	Remember	8

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8	Design a channel section by Kennedy 's theory given the following data: Discharge Q =2828 cumecs Kutter 's N=0 .0225 Critical velocity ratio 'm' =1 Side slope = 1/2 : 1 B/ D = 7 .6 Find also the bed slope of the channel.	Understand	8
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	Remember	9
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.	Remember	8

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