



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER

B.Tech VI Semester End Examinations (Regular), May - 2020

Regulations: R16

WATER RESOURCES ENGINEERING

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT- I

1. a) Describe the importance of various hydrologic data in water resources engineering and What are the various methods available to calculate average precipitation over a basin. [7M]
- b) In the month of July 1999, a reservoir with water spread area of 1640 hectare has dropped its water level by 1.10m. Rainfall during the month is 28cm and evaporation is 22cm. if the average inflow is 0.64m³/s, calculate the average rate of drawl of water from the reservoir assuming no other losses. [7M]
2. a) Explain the various forms of precipitation. And also write down the methods to minimize the loss due to evaporation. [7M]
- b) An experimental rectangular plot of 10km X12km has 5 rain gauge stations. Fit a coordinate system to the plot such that the side 10km represents the abscissa. The storm rainfall and coordinates of the stations are as follows:

Station	Station coordinate	Normal annual Rainfall(cm)	Storm rainfall(cm)
A	(1,3)	128	12
B	(8,11)	114	11.4
C	(3,10)	136	13.2
D	(5,8)	144	14.6
E	(7,5)	109	?

[7M]

Compute the missing rainfall of station E. Find the average rainfall of the plot by Thiesson Polygon and isohyetal method.

UNIT - II

3. a) Briefly explain the factors that affect the runoff from the basin and Explain the Depth-Area-Duration curve. [7M]
- b) 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 L_c = 14 km are 50m³ /s and 9 h respectively. Assuming that Snyder's synthetic unit hydrograph applies determine the coefficient C_t and C_p. Determine the 2 h unit hydrograph for the upper 180 km² of the same watershed which has L= 20km and L_c = 11.8 km. [7M]

4. a) Write the formulae used to calculate unit hydrograph. [7M]
- b) The rates of rainfall for successive 30 minute period of a 3-hour storm are 1.5, 3.2, 4.3, 2.7, 2.1 and 1.2 cm/hr. The surface runoff in response to the storm is estimated to be 3.0 cm. Determine ϕ -index and w-index. Consider a total of depression and interception losses of 1.0 cm. [7M]

UNIT – III

5. a) What is specific retention? How it is different from Specific yield? [7M]
- b) A loam soil has field capacity of 22% and wilting coefficient of 10 %. The dry unit weight of soil is 1.5 g/cm³. 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. [7M]
6. a) Differentiate between shallow dug wells and deep dug wells. How the dug well is constructed? [7M]
- b) 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? [7M]

UNIT – IV

7. a) What is meant by Furrow irrigation and Sprinkler irrigation? Which one is Preferred in India and Why. [7M]
- b) A watercourse has a cultivable 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. [7M]
8. a) 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. [7M]
- b) 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. [7M]

UNIT – V

9. a) Discuss critically the statement “The banks 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”. [7M]
- b) 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 [7M]
10. a) Why Lacey’s conception is superior to that of Kennedy’s? [7M]
- b) Design a channel section by Kennedy ’s theory given the following data:
 Discharge Q =2828cumecs
 Kutter ’s N=0 .0225
 Critical velocity ratio ‘m’ =1
 Side slope e = 1/2 : 1 B/ D = 7 .6
 Find also the bed slope of the channel. [7M]



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COURSE OBJECTIVES:

The course should enable the students to:

I	Enrich the knowledge of hydrology that deals with the occurrence, distribution and movement of water on the earth.
II	Design unlined and lined irrigation canals; mitigate sediment problems associated with canal.
III	Identifying, formulating and management of water resource related issues.
IV	Discuss the limitations and applications of hydrograph flood analysis

COURSE OUTCOMES (COs):

CO 1	Understand the basic knowledge of hydrology, hydrological cycle, precipitation and movement of water on earth and below the earth surface in addition to importance and estimation of runoff.
CO 2	Determining the importance of different types of hydrographs.
CO 3	Importance and occurrence of Ground water, estimation of discharge through various types of aquifers, wells development.
CO 4	Analyze the importance of irrigation and their types, methods of application of irrigation water, duty and delta, irrigation efficiencies, water logging.
CO 5	Understand the classification of canals, design of irrigation canals, IS standards for a canal design canal lining, SCS curve number method, flood frequency analysis of stream flow.

COURSE LEARNING OUTCOMES (CLOs):

ACE014.01	Understand the basic concepts of Hydrology and its applications. And also understand different forms and types of precipitation..
ACE014.02	Understand the Rainfall measurement methods and different types of Rain gauges
ACE014.03	Compute the average rainfall over a basin, processing of rainfall data, and adjustment of rainfall record and usage of double mass curve.
ACE014.04	Understand the concepts of runoff, factors affecting runoff, runoff over a catchment, empirical and rational formulae.
ACE014.05	Understand the abstraction from rainfall, evaporation, factors affecting evaporation, measurement of evaporation, evapo-transpiration, penman and Blaney- Criddle methods and infiltration.
ACE014.06	Understand the concept of Hydrograph, effective rainfall, and base flow separation
ACE014.07	Analyze the concept of direct runoff hydrograph
ACE014.08	Analyze the importance of unit hydrograph, definition and limitations applications of unit hydrograph.
ACE014.09	Understand the derivation of unit hydrograph from direct runoff hydrograph and runoff hydrograph to unit hydrograph
ACE014.10	Understand the concept of synthetic unit hydrograph and its applications.
ACE014.11	Understand the Ground water Occurrence and types of aquifers
ACE014.12	Define and understand the different terminology of water resource engineering like aquifer parameters, porosity, specific yield, permeability, and Transmissivity.
ACE014.13	Determine the radial flow to wells in confined and unconfined aquifers
ACE014.14	Understand the concept of Darcy's law in aquifers
ACE014.15	Understand the Types of wells, well construction, and well development.

ACE014.16	Understand the work necessity and importance of irrigation, advantages and ill effects of irrigation, types of irrigation
ACE014.17	Explain the methods of application of irrigation water and understand the India agricultural soils, methods of improving soil fertility, crop rotation, and preparation of land for irrigation
ACE014.18	Understand the standards of quality for irrigation water, soil, water, plant relationship, vertical distribution of soil moisture, soil moisture constants.
ACE014.19	Calculate the soil moisture tension, consumptive use, duty and delta and understand the factors affecting duty.
ACE014.20	Determination of design discharge for a water course. Depth and frequency of irrigation, irrigation efficiencies, water logging
ACE014.21	Understand the mechanical classification of canals
ACE014.22	Design of irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting
ACE014.23	Calculate by using IS standards for a canal design canal lining and design discharge over a catchment, computation of design discharge, rational formula.
ACE014.24	Understand the SCS curve number method and flood frequency analysis of stream flow.

MAPPING OF SEMESTER END EXAMINATION - COURSE OUTCOMES

SEE Question No		Course Learning Outcomes	Course Outcomes	Blooms Taxonomy Level	
1	a	ACE014.01	Understand the basic concepts of Hydrology and its applications. And also understand different forms and types of precipitation..	CO 1	Understand
	b	ACE014.03	Compute the average rainfall over a basin, processing of rainfall data, and adjustment of rainfall record and usage of double mass curve.	CO 1	Remember
2	a	ACE014.01	Understand the basic concepts of Hydrology and its applications. And also understand different forms and types of precipitation..	CO 1	Understand
	b	ACE014.02	Understand the Rainfall measurement methods and different types of Rain gauges	CO 1	Remember
3	a	ACE014.06	Understand the concept of Hydrograph, effective rainfall, and base flow separation	CO 2	Understand
	b	ACE014.08	Analyze the importance of unit hydrograph, definition and limitations applications of unit hydrograph.	CO 2	Remember
4	a	ACE014.08	Analyze the importance of unit hydrograph, definition and limitations applications of unit hydrograph.	CO 2	Understand
	b	ACE014.09	Understand the derivation of unit hydrograph from direct runoff hydrograph and runoff hydrograph to unit hydrograph	CO 2	Remember
5	a	ACE014.12	Define and understand the different terminology of water resource engineering like aquifer parameters, porosity, specific yield, permeability, and Transmissivity.	CO 3	Understand
	b	ACE014.12	Define and understand the different terminology of water resource engineering like aquifer parameters, porosity, specific yield, permeability, and Transmissivity.	CO 3	Remember

6	a	ACE014.11	Understand the Ground water Occurrence and types of aquifers	CO 3	Understand
	b	ACE014.13	Determine the radial flow to wells in confined and unconfined aquifers	CO 3	Remember
7	a	ACE014.16	Understand the work necessity and importance of irrigation, advantages and ill effects of irrigation, types of irrigation	CO 4	Understand
	b	ACE014.17	Explain the methods of application of irrigation water and understand the India agricultural soils, methods of improving soil fertility, crop rotation, and preparation of land for irrigation	CO 4	Remember
8	a	ACE014.19	Calculate the soil moisture tension, consumptive use, duty and delta and understand the factors affecting duty.	CO 4	Understand
	b	ACE014.20	Determination of design discharge for a water course. Depth and frequency of irrigation, irrigation efficiencies, water logging	CO 4	Remember
9	a	ACE014.23	Calculate by using IS standards for a canal design canal lining and design discharge over a catchment, computation of design discharge, rational formula.	CO 5	Understand
	b	ACE014.22	Design of irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting.	CO 5	Remember
10	a	ACE014.22	Design of irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting	CO 5	Understand
	b	ACE014.23	Calculate by using IS standards for a canal design canal lining and design discharge over a catchment, computation of design discharge, rational formula.	CO 5	Remember

Signature of Course Coordinator

HOD, CE