WATER RESOURCES ENGINEERING

Runoff-Runoff Process – Unit Hydrograph – Derivation and Analysis – S-Hydrograph – Synthetic Unit Hydrograph-Instantaneous Unit Hydrograph – Methods of Determining IUH – Conceptual Models of IUH – Formulation of Models – Concept of Linear Reservoir- Models of Nash and Dooge and Kulandaiswamy- Nonlinearity of Runoff-Distribution – Overland Flow Steam Flow – Flow Duration and Mass Curves and Time Series Analysis.

Floods: Importance of Flood Studies – Definition- Causes of Floods- Seasonal Distribution of Floods- Design Flood- Factors Affecting Flood Flow; Magnitude and Frequency of Floods – Empirical- Probability and Unit Hydrograph Methods; Flood Control Measures: Flood Control Reservoirs – Types- Location- Size – Levees and Flood Walls – Stage Reduction and Reduction in Peak Discharge Flood Routing Through Reservoirs.

Water Resources Engineering Introduction to Water Resources- Hydrological Cycle – Characteristics – Surface and Ground Water Resources – Quality Conservation and Flood Control; Water Resources Planning – Purpose of Water Resources Development- Classification of Water Resources Development Projects- Functional Requirements of Multipurpose Projects- Process of Project FormulationProject Evaluation- Strategies for the Future- Planning Strategies- Management Strategies.

Climate Change on Water Resources - Climate and Weather- the Vital Importance of Monsoon Rains- Clouds- Storms and Precipitation- Influences and Feedbacks of Hydrological Changes on Climate- Observed Climate Change Impacts- Future Changes in Water Availability and Demand Due to Climate Change- Climate Related Drivers of Freshwater Systems in the Future- Impacts of Climate Change on Water Stress in the Future- Freshwater Areas and Sectors Highly Vulnerable to Climate Change- Potential Water Resource Conflicts Between Adaptation and Mitigation.

Site Investigations and Design Aspects of Water Resources - Surface Water Resources – Minor Tanks- Reservoirs- Diversion Head Works; Ground Water Resources – Tube Wells- Open Wells. Rainwater Harvesting- Rainwater Harvesting- Artificial Recharge of Ground Water.

Application of Remote Sensing (RS) and Geographical Information System (GIS) in Water Resource - A Brief History of RS- Sensor Systems Used in RS- RS Satellites- Landsat- and IRS. Remote Sensing Applications in Civil Engineering Projects GIS Over View- GIS Components Raster Data Models and Vector Data Model- Application of RS and GIS in Water Resources Engineering.

Reference Books :

1. Hydrology by Wisler- C.O. and E.F. Brater- John Wiley and Sons..
2. Geo-Hydrology by De Wiest- R.J.M.- John Wiley and Sons.
3. Hydrology for Engineers by Linsley- R.K.- M.A. Kohler and J.L.H. Paulus McGraw-Hill.
4. Water Resources Engineering by Linsely- R.K.- J.B. Franzini- D.L. Freyberg and G. Tchobanoglous- McGraw- Hill Publishing Co.; 4th edition.
5. Irrigation Engineering and Hydraulic Structures by Garg S.K. Khanna Publishers.
6. Principles of Geographical Information Systems for land resource assessment by Burrough- P.A.- Clarendon press- Oxford.
7. Remote Sensing in Civil Engineering by Kennie- J.M. and M.C. Matthews McGraw-Hill. 8. Remote Sensing: Principles and Interpretation by Sabins F.F.-Waveland Pr Inc- 3 rd Edition.
9. Impacts of climate change and climate variability on hydrological regimes by Jan C. van Dam- Cambridge University Press.
10. IPCC fourth assessment report- The AR4 synthesis report
11. IPCC fourth assessment report- Working Group I report- The physical Science Basis.
12. IPCC fourth assessment report- Working Group II report- Impacts- Adaptation and vulnerability.
13. IPCC fourth assessment report- Working Group III report- Mitigation of Climate Change.

ANDHRA UNIVERSITY
TRANS-DISCIPLINARY RESEARCH HUB

MODEL QUESTION PAPER

WATER RESOURCES ENGINEERING

1. a) What do you understand by runoff? Explain SCS-N method for prediction direction runoff?
   b) A storm produced rainfall intensities of 0.85, 2.25 and 1.25 cm/hr on the drainage basin of area 104 sq.km in 3 successive time periods of 4 hr each. Assuming a base flow of 10 cumecs and a Ø index of 2.5 mm/hr. Determine the total runoff hydrograph produced by this storm. The 4hr UH is given below.

Hours	0	2	4	6	8	10	12	14	16	18
4hr UH (Cumecs)	0	13.5	18.32	23.54	17.84	14.79	12.18	10.04	8.26	6.51

Hours	20	22	24	26	28	30	32	34
4hr UH (Cumecs)	4.98	3.95	3.00	2.26	1.50	1.07	0.50	0

2. a) Explain the Nash's Conceptual model for IUH and derive the equation for IUH.
   b) Calculate the synthetic UH parameters for the following data.
   Catchment area = 950 sq.km
   L = 48 km, Lc = 21 km, Ct= 1.65, Cp = 0.57.
3. a) Explain the concept of flood routing through reservoirs.
   b) Write short notes on methods of flood control.
4. a) What are the methods of estimations design flood?
   b) Determine the design flood discharge for a bridge site with the following data:
   Catchment area: 2×10^5 ha
   Duration of storm: 8 hrs
   Storm Precipitation: 3cm
   Time of Concentration: 2 hr.
   Gauges discharge for a part flood with average maximum daily rainfall of 18 cm was 3400
   cumecs.
5. a) Give an account of water resources of India.
   b) Give the classification of water resources development projects. Explain about the functional requirement of multi-purpose projects.
6. a) What are the future changes in water availability and demand due to climate change.
   b) Write short notes on influences and feedbacks of Hydrological changes on climate.
7. a) Explain site investigations and design aspects of minor tanks.
   b) Explain various methods of Rainwater Harvesting.
8. a) What do you understand by geospatial analysis? Why it is required? Explain the slope and aspect analysis in GIS.
   b) Explain the application of RS in Hydrological sciences.