SECTION – D

8. (a) What is the role of water in national development ? 5

(b) What are various factors to be considered while planning for water resources ? 10

9. (a) Explain long-term water resource planning. 5

(b) Define reservoir capacity and explain the Empirical-Area reduction method. 10

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B. Tech. 5th Semester (Civil Engg.)
Examination – March, 2021

HYDROLOGY AND WATER RESOURCE ENGINEERING

Paper : PCC-CE-301-G

Time : Three hours] [**Maximum Marks : 75**

Note : **Question No. 1 is compulsory.** Attempt *five* questions in all, selection *one* question from each Section. All questions carry equal marks.

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

1. Write a short note on the following : 2.5 × 6 = 15

(a) Water budget equation

(b) Forms of precipitations

(c) Evapotranspiration

(d) Unit hydrograph

(e) Flow duration curve

(f) Rain gauges

SECTION – A

2. (a) Explain the hydrological cycle with proper diagrams. **6**

(b) The average normal rainfall of 5 rain gauges in the base stations is 89, 54, 45, 41 and 55 cm. If the error in the estimation of rainfall should not exceed 10%, how many additional gauges may be required ? **9**

3. A catchment area has seven rain gauge stations. In a year, the annual rainfall recorded by the gauges are as follows : **15**

Station :	P	Q	R	S	T	U	V
Rainfall (cm.)	130.00	140.00	120.00	110.00	160.00	100.00	145.00

(a) Determine the standard error in the estimation of mean rainfall in the existing set of rain gauges.

(b) For a 5% error in the estimation of the mean rainfall, calculate the minimum number of additional rain gauge stations to be established in the catchment.

SECTION – B

4. (a) Explain evapotranspiration and factors affecting evapotranspiration. **10**

(b) Explain run-off characteristics of a stream. **5**

5. For a catchment in UP, India, the mean rainfall and temperatures are given. Calculate the annual run-off coefficient by Khosla's formula. **15**

Month	Jan.	Feb.	March.	April	May	Jun	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temp.(°c)	12	16	21	27	31	34	31	29	28	29	19	14
Rainfall (cm.)	4	4	2	0	2	12	32	29	16	2	1	2

SECTION – C

6. (a) What are the components and factors affecting the shape of the hydrograph ? **5**

(b) What are the different methods of estimation of floods ? **10**

7. What is a unit hydrograph ? The Unit hydrograph co-ordinated if 1 Cm, 1 hr. Unit hydrograph are as follows :

Time (hr.)	0	1	2	3	4	5	6	7	8	9	10
Discharge(m³/s)	0	6	12	21	16	10	8	5	2	1	0

Find flood hydrograph for a storm of 2cm/h for 1hr. Also, find the area of the catchment in km^2. **15**