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FIRST SEMESTER **M. Tech. CIVIL**

SUPPLEMENTARY EXAMINATION FEB-2019

CE- 532 ADVANCED HYDROLOGY

Time: 3 Hours *Max. Marks : 100*

Note : Question 1 is compulsory. Attempt 10 more questions. Assume suitable missing data, if any.

1 Answer Ten parts of the question

[a] Write basic equations used in Lumped flow routing and in Distributed flow routing techniques.

[b] State the method of flow routing used as short term method of forecasting for the Yamuna water level in Delhi.

[c] Compare the applicability of simplified models of Hydraulic flood routing techniques. Which of these models do you propose for flood routing in upper reaches of hilly terrains?

[d] Differentiate between Explicit and Implicit schemes of Kinematic wave routing with the help of relevant equations.

[e] Which model of flood routing do you propose for flow routing through a meandering river in its flood plains? Comment on applicability of lumped flow models in these rivers.

[f] Write a short note on applications of Maximum Intensity-Duration-Frequency relationship in Hydrology.

[g] Compare annual flow time series generation with monthly flow time series generation for a river.

[h] Explain in brief applicability of different modelling approaches in Hydrology. How do you test the model before using it for data generation?

[i] Write a brief note on application of ARIMA and ARMA models in Hydrology. Give one example of each of them.

[j] Enlist few examples where regression analysis is used successfully in Hydrology.

[k] Write a brief note on flood discharge estimation by moving boat method.

[l] Write a brief note on structural methods of flood management.

(4x10)

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2 A rectangular parking lot is 140 m x 280 m long. The time of overland flow across the pavement to the longitudinal gutter along the centre is 18 minutes and the estimated total time of concentration to the down stream end of the gutter is 24 minutes. The runoff coefficient is 0.9. If rainfall of intensity 6 cm /hr falls on the lot for 3 minute and stops abruptly, determine the hydrograph upto its peak magnitude. (6)

3 Analysis of annual flood series of a river yielded a sample mean of 1100 m^3/sec and standard deviation of 500 m^3/sec. Estimate the design flood of a structure on this river to provide 90% assurance that the structure will not fail in next 60 years. Use Gumbel's method and assume the sample size to be very large. (6)

4 A basin has 400 km^2 of area L=35 km, LCA=11km. Assuming C_t = 1.5 and C_p = 0.7, develop a 3 hour synthetic unit hydrograph. (6)

5 For a sub basin of area 280 km^2, the following values of Nash model coefficients were found to be appropriate : n = 3.1, K = 1.8 hrs. Determine the coordinates of 1hr UH at 3 h interval up to its peak values of the discharge. (6)

6 Flood-frequency computations for a river by using Gumbel's method, yielded the following results:

Return period T (years)	Peak flood (m^3/sec)
50	40,810
100	46,300

Estimate the flood magnitude in this river with a return period of 500 years. (6)

7 A drainage basin has 160 km^2 area, 7 hours time of concentration and 9 hours as storage constant with the following information about inter-isochrone area distribution, determine 1 hour unit hydrograph. (6)

Time (h)	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Inter isochrones Area (km^2)	10	22	36	43	35	10	4

8 The following are the data of the monthly ground water table fluctuations, precipitation and ground water pumping in certain area. Obtain a regression relation and correlation coefficients (6)

Months	1	2	3	4	5	6	7	8	9	10	11
Precipitation	30	52	95	90	200	280	168	51	18	27	52
Ground WT	3.60	4.05	4.12	4.57	4.8	4.95	5.02	4.80	4.42	4.20	3.90
GW pumping rate	14.0	23.4	32.4	51.2	62.3	79.5	61.4	47.4	34.4	18.9	1.80

9 From the following data of annual runoff depths in cm over a catchment, find if there is any trend in the data. Remove the trend by moving average method. (6)
36, 43, 44, 40, 35, 39, 41, 47, 45, 49, 52, 58.

10 Based on river flow data at a site for 10 years the following equation for Thomas- Fiering model for months of December and January was found applicable. (6)
$Q_{Dec} = 12.2 + (0.14)\,(Q_{Nov} - 81.2) + t_i\, 15.31\,(1 - 0.958^2)^{1/2}$
$QJan = 0.80 + (-0.05)\,(Q_{Dec} - 12.2) + t_i\, 1.96\,(1 - 0.039^2)^{1/2}$
Generate the probable flow sequence for next 3 months.

11 During a flood the water surface at a section in a river was found to increase at a rate of 11.5 cm/h. The slope of the river is 1/3300 and the normal discharge for the river stage read from a steady rating curve was 150m^3/s. If the velocity of flood wave can be assumed as 2.5 m/s, determine the actual discharge. (6)

12 Write a brief note on application of Implicit dynamic wave model in Hydraulic flood routing. (6)

END