

**PARUL UNIVERSITY**  
**FACULTY OF ENGINEERING & TECHNOLOGY**  
**M.Tech. Winter 2017 - 18 Examination**

**Semester: 2**  
**Subject Code: 03214152**  
**Subject Name: Hydrological Modelling**

**Date: 09/01/2018**  
**Time: 2.00 pm to 4.30 pm**  
**Total Marks: 60**

**Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

**Q.1 (A) Fill in the blanks :** **(05)**

- ( i ) Watershed changes can produce a \_\_\_\_\_ flood record. (non homogeneous , homogeneous , continuous , non continuous )
- ( ii ) When a change in watershed processes occurs over a relatively long time period, the continual change in the flood record caused by this watershed change is referred to as a \_\_\_\_\_. ( non secular change , secular change , non episodic change , episodic change )
- ( iii ) The effects of \_\_\_\_\_ due to watershed change should be assessed from both graphical presentations and statistical testing of the data. (non homogeneity , homogeneity , randomness , episodic change )
- ( iv ) Time series \_\_\_\_\_ is the analysis of a temporally distributed sequence of data or the synthesis of a model for prediction in which time is an independent variable. ( graphs , modeling , calculation , study )
- ( v ) Moving-average filtering is a computational technique for -----the effects of non systematic variations. ( multiplying , subtracting , reducing , adding )

**(B) Enumerate the methods of testing a hydrologic model and explain the best method .** **(05)**

**(C) Fill in the blanks :** **(05)**

- i) A time series consists of two general types of variations \_\_\_\_\_,
- ii ) Both types of variation must be \_\_\_\_\_ in order to formulate a model that can be used to predict or synthesize expected values and future events.
- iii) An upward-sloping trend due to urbanization or the annual variation of air temperature could be modeled as \_\_\_\_\_.
- iv) Time series modeling that relies on the analysis of data involves four general phases:  
 \_\_\_\_\_ .

**Q.2 Answer the following questions. (Attempt any three) (Each five mark)** **(15)**

**(A) Fill in the blanks :**

- ( i ) In the most general sense , a model is a simplified representation of a \_\_\_\_\_.  
 ( system / prototype / machine / vehicle ) .
- ( ii ) A system consists of entities and relationships between \_\_\_\_\_.  
 ( variables / precipitations / parameters / entities ) .
- ( iii ) The most difficult part in the modelling is \_\_\_\_\_.  
 ( conceptualization / formulation / programming / evaluation )
- ( iv ) Coefficient of determination is the \_\_\_\_\_.  
 ( most reliable / less reliable / most / insignificant technique ) to test the model .
- ( v ) Willmott (1981) sought to overcome the insensitivity of correlation based measures to differences in the observed and model simulated means and variances by developing \_\_\_\_\_.  
 ( Index of agreement / RMSE / MAE / Unequality ) .

(B) W . r . t . the following data of precipitation versus runoff conceptualize a corresponding model and check its accuracy from the point of view of Index of agreement .

Month	Precipitation , cm	Runoff , cm	Month	Precipitation , cm	Runoff , cm
1	30	15	7	31	24
2	12	9	8	29	17
3	10	7	9	23	11
4	2	1	10	8	3
5	7	2	11	5	1
6	20	12	12	40	10

(C) Discuss why it is important to use both correlation and graphical analyses in evaluating bivariate data and why the use of each without the other is inadequate.

(D) The following data measured from 18 debris basins in south Gujarat were subjected to a Dixon–Thompson test. The debris volumes are expressed in  $m^3 / Km^2$  . The goal was to evaluate the data for a low outlier while assuming a normal distribution.

75000 123980 125070 79000 129200 25000 77050 60000 75040 90000 125070 330300  
33999 66420 67140 26000 2010 29040

**Q.3 (A)** Discuss moving average filtering in time series analysis. **(07)**

**(B)** For a sample size of ten, with the Dixon–Thompson test, what largest value of  $X_{10}$  is necessary to reject the largest sample value as a high outlier if  $X_2 = 4.3$  and  $X_9 = 11.4$ ? **(08)**

**OR**

**(B)** The Dixon–Thompson test can be applied to the flood series for Gambhiri, to test the largest value as an outlier: (5790, 338, 300, 540, 162, 267, 312, 108, 371, 359, 50, 245, 318, 194, 62, 160, 358, 454, 540, 438, 328, 227, 126, 25). In this case, the value to be examined is prespecified so it is appropriate to use a one tailed upper test. **(08)**

**Q.4 (A)** Discuss the pros and cons of censoring extreme events. **(07)**

**OR**

**(A)** What are the characteristics of a null hypothesis and an alternative hypothesis? **(07)**

**(B)** Explain how will you analyse a Bivariate Histogram . **(08)**