M.Sc. Examination, 2018
Semester-III
Statistics
Course : MSC-34 : MSS-3

(Time Series Analysis)

Time : 3 Hours **Full Marks : 40**

Questions are of value as indicated in the margin

Answer **any four** questions

1. Define Time Series. Explain the nature cyclical variations in a time series. How do seasonal variations differ from them? Give an outline of any method of measuring seasonal variations. 2+2+2+4=10

2. a) Explain the exponential smoothing method for forecasting time series. 4

   b) Suggest how the smoothing factor should be determined? 3

   c) What are the advantages and disadvantages of exponential smoothing? 3

3. a) Discuss auto correlation. For the model

   $Y_t = \beta X_t + u_t, u_t = \rho u_{t-1} + \varepsilon_1$

   where $E(\varepsilon_t) = 0$, and $Cov(\varepsilon_t, \varepsilon_{t'}) = \sigma^2 I$

   Find the estimate of β.

   b) Let $S_t = X_1 + X_2 + ... + X_t$, where X_t's are iid$(0, \sigma^2)$ variables. For h>0, find Cov (S_{t+h}, S_t) and comment on stationarity of the process $\{S_t\}$. 5

4. Write down an MA (2) process? Derive the auto-correlation functions and partial auto correlation functions of order 2 and 3 for the process. Which of the component of time series is mainly applicable in the following cases?

   a) Full of death due to advancement in sciences,

   b) Fire in a factory.

   c) Sales of New Year greetings cards. 1+6+3=10

5. What is a periodogram? Describe how the hidden periodicity of a Time Series can be estimated. 2+8=10

6. a) Deduce the power spectrum of the white noise process and justify name of the process.

   b) For the process $Z_t = 10 + a_t + a_{t-1}$ and $Z_t = 10 + a_t - a_{t-1}$ where $\{a_t\}$ is a sequence of uncorrelated N(0,1) variables. Find the covariance functions and spectral density functions of the processes. 4+3+3=10