Model Question Paper

Fourth Semester M.Sc. Degree Examination (CSS)

ST4 E07: TIME SERIES ANALYSIS

Time : 3 hours **Total weights: 30**

Part A

(**Answer any 5 questions. Weightage 1 for each question)**

1. State different components of a time series.
2. Define a simple exponential smoothing model.
3. Explain the relationship between a time series and a stochastic process.
4. Define auto covariance function and auto correlation function.
5. Obtain the autocorrelation function of an MA(1) process.
6. Define ARIMA(*p*, *d*, *q*) model.
7. Describe a method of estimation of parameters of an AR(1) model.
8. Describe any of the diagnostic checking methods in time series modelling.

Part B

(Answer any 5 questions. Weightage 2 for each question)

9. Explain how will you estimate seasonality in a given time series. How will you test for seasonality?

10. Explain the forecasting procedure based on exponential smoothing.

11. Define partial autocorrelation function of stationary stochastic process. Explain the behaviour of the partial autocorrelation function of an AR(p) process.

12. Find the spectral density function of the MA(2) model $X_t = 0.5\varepsilon_{t-2} + 0.8\varepsilon_{t-1} + \varepsilon_t$, where $\{\varepsilon_t\}$ is a white noise process with mean 0 and variance σ^2.

13. Derive the stationarity conditions for an AR(*p*) process.

14. Describe the invertability condition for an MA(*q*) process.

15. Describe the maximum likelihood method of estimation of the parameters of an AR(1) model.

16. Describe the role of residual analysis in model checking.

Part C

(Answer any 3 questions. Weightage 5 for each question)

17. (i) Explain the important components of a time series.
(ii) Describe Holt-Winters smoothing procedure.

18. (i) Give an example of two MA(1) processes having the same ACF.
(ii) Describe ant two tests for stationarity of the estimated noise sequence in a time series data.

19. (i) Discuss the properties of the ACF and PACF of MA(q) process.
(ii) Show that the ARMA(1,1) process $X_t = 0.5X_{t-1} + \varepsilon_t - 0.3\varepsilon_{t-1}$ is stationary and invertable.

20. (i) Write down the ACF of order k for an AR(1) model $X_t = 0.7X_{t-1} + \varepsilon_t$, where $\{\varepsilon_t\}$ is a white noise process. Show that this AR(1) model can be expressed as a MA process of infinite order. Hence or otherwise discuss the stationarity of the AR(1) process.
(ii) Find an invertable process which has the following ACF: $\rho_0 = 1, \rho_1 = 0.25$ and $\rho_k = 0$ for $k \geq 2$.

21. (i) Derive the Yule-Walker equations satisfied by the a.c.f. of an AR(p) process.
(ii) How will you determine the order of an autoregressive process? Explain.

22. (i) Describe least squares estimation of parameters of the AR(2) model $X_t = \alpha_1 X_{t-1} + \alpha_2 X_{t-2} + \varepsilon_t$, where $\{\varepsilon_t\}$ is a white noise process with mean 0 and variance σ^2.
(ii) How will you find the choice of MA periods in fitting a time series data?