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NATIONAL INSTITUTE OF TECHNOLOGY HAMIRPUR
Department of Mathematics & Scientific Computing
End-semester examination
Class: B. Tech – 6th Semester

Course Title: Time series Analysis

Maximum Marks: 50

Note: All questions are compulsory and carry equal marks (5).

Course code: MA-323

Time: 3:00 Hours

Q.1 a) Define Stationary and non-stationary time series. Check the stationarity of the following model.

$$z_t - z_{t-1} = a_t - 1.3 a_{t-1} + 0.3 a_{t-2}$$

b) Write the operator form of the following models.

$$z_t - 0.5 z_{t-1} = a_t - 1.3 a_{t-1} + 0.4 a_{t-2}$$

Q.2 Define ARIMA models and also discuss Box-jenkins methodology.

Q.3 Discuss mean, variance and autocorrelation function of autoregressive AR(2) and moving average MA(2).

Q.4 a) For AR (2) process, $z_t = 1.0z_{t-1} + 0.5z_{t-2} + a_t$

Calculate mean, variance, auto-correlation function of z_t .

b) Evaluate the mean, variance and autocorrelation function of $z_t = a_t + 1.3a_{t-1} + 0.4a_{t-2}$

Q.5 What are exponential smoothing methods? Explain Simple exponential smoothing method and Holt's trend corrected method along with procedure.

Q.6 Calculate the forecaste values for the given weekly demand values by using Holt's trend corrected method by taking smoothing parameters $\alpha = 0.2$ and $\beta = 0.1$.

Week	1	2	3	4	5	6	7	8	9	10
Actual demand	210	198	195	204	217	229	207	214	209	223

Q.7 Compute the seasonal indices by using ratio to trend method, from the following data

Year	Quarter -I	Quarter -II	Quarter -III	Quarter -IV
2000	32	38	36	34
2001	42	52	38	42
2002	52	50	42	52
2003	62	68	56	74
2005	80	88	82	90

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Q.8 a) Find the cross correlation and covariance matrix for the given data set.

Time	Variable 1	Variable 2
1	20	30
2	21	31

b) Write the mathematical formulation of VARMA (p,q) and what is the condition for stable?

Q.9 a) What is multivariate time series? What are the conditions for stationary multivariate time series.

b) What is the difference between correlation and covariance?

Q.10 Discuss the SARIMA models and classify as a member of the class of ARIMA (p, d, q) processes in the following model

$$(1 - 0.2B)(1 - B)z_t = (1 - 0.5B)a_t$$