UNIVERSITY OF THE PUNJAB

Roll No. in Fig. ....

B.S. 4 Years Program / Eighth Semester – 2019

Roll No. in Words. ....

Paper: Time Series Analysis-II
Course Code: STAT-413 Part – I (Compulsory) Time: 15 Min. Marks: 10

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Signature of Supdt.:

ATTEMPT THIS PAPER ON THIS QUESTION SHEET ONLY.
Division of marks is given in front of each question.
This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the correct option. **(10x1=10)**

1. The residuals obtained from a good fitted ARMA(p,q) model will show the insignificant autocorrelations
   A. At all non-zero lags
   B. After lag p.
   C. After lag q.
   D. After lag (p+q)

2. Among the good-fitted models, the best model will have the __________ value of AIC.
   A. constant
   B. largest
   C. smallest
   D. zero

3. The forecast error __________ with an increase in lead time.
   A. remains constant
   B. decreases
   C. increases
   D. Both A and B.

4. The forecast errors at lead time one with different forecast origins are
   A. Perfectly positively correlated.
   B. Perfectly negatively correlated.
   C. Uncorrelated
   D. Both A and B.

5. Portmanteau test applied to first 'm' residuals autocorrelations resulting from an ARMA(p,q) model will have degrees of freedom equal to
   A. $p + q$
   B. $m + p + q$
   C. $m - p + q$
   D. $m - p - q$

6. In portmanteau test, 'm' must satisfy the condition:
   A. $m > p + q$
   B. $m < p + q$
   C. $m > p - q$
   D. $m < p - q$

P.T.O.

7. If the autocorrelation function cuts-off to zero after lag 3 then the time series might have been generated by:
   A. MA(3) process
   B. AR(3) process
   C. ARMA(3,3) process
   D. ARIMA(0,3,0) process

8. Which of the following is not a property of autocorrelation function:
   A. It is an even function.
   B. It is bounded between -1 and +1.
   C. It is an odd function.
   D. All above.

9. Yule-Walker method is used to estimate the parameters of
   A. Random walk
   B. Autoregressive process
   C. Moving Average process
   D. Purely random process

10. The partial autocorrelation function of an AR(p) process
   A. Tails-off after lag p.
   B. Cuts-off after lag p.
   C. Exponentially increases after lag p.
   D. None of above.

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Roll No. ....

B.S. 4 Years Program / Eighth Semester – 2019

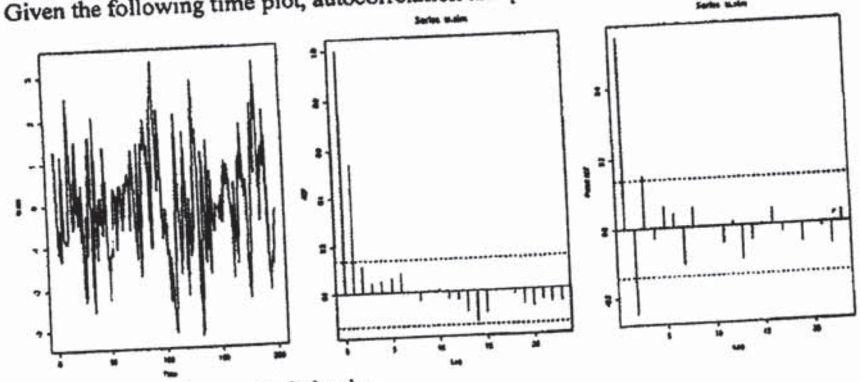
Paper: Time Series Analysis-II **Time: 2 Hrs. 45 Min. Marks: 50**

Course Code: STAT-413 Part – II

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Note:-Attempt ALL the questions.

Q.2 Given the following time plot, autocorrelation and partial autocorrelation functions: **[6]**



a) Discuss the graphs behavior.

b) Identify the candidate ARMA model(s).

Q.3 Given the following information, estimate the parameters of AR(2) model. **[6]**

$$\overline{Y} = 0.21, r_1 = 0.87, r_2 = 0.83$$

Q.4 Following are the autocorrelations obtained for the residuals by fitting an ARMA(2,1) process to an observed time series with n = 200. **[8]**

k	1	2	3	4	5
r_k	0.04	-0.13	0.25	-0.01	0.09

State the hypothesis and test the goodness of fitted model using a portmanteau test for m= 5. Use 5% level of significance.

Q.5 Given the following AR(2) process **[10]**

$$Y_t = \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + Z_t$$

Derive the loss function for the Maximum likelihood estimation of AR parameters. Also obtain the MLEs (approximate) of ϕ_1, ϕ_2 and σ_z^2.

Q.6 Show that the minimum mean squared error forecast with origin at n and lead time l is for an AR(1) process $Y_t = \phi Y_{t-1} + Z_t$ is given by **[10]**

$$Y_n(l) = \phi^l Y_n$$

with forecast error variance

$$var(e_n(l)) = \sigma_z^2 \left(\frac{1-\phi^{2l}}{1-\phi^2}\right)$$

Q.7 An AR(1) model $Y_t - 53 = 0.65(Y_{t-1} - 53) + z_t$, is fitted to an observed time series of 100 observations. Now a practitioner wants to use this model to forecast Y_{101} and Y_{102}. **[10]**

i. Compute the MMSE forecasts of Y_{101} and Y_{102}, if $Y_{99} = 52.7, Y_{100} = 53.5$ using (a) $\psi(B)$ polynomial. (b) $\pi(B)$ polynomial.

ii. Suppose that Y_{101} comes out to be 51.3, update the forecast of Y_{102} by shifting forecast origin to $t = 101$.