



**WEST BENGAL STATE UNIVERSITY**  
B.Sc. Honours 5th Semester Examination, 2021-22

**STSACOR11T-STATISTICS (CC11)**

**STOCHASTIC PROCESS AND TIME SERIES**

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.  
Candidates are required to give their answers in their own words as far as practicable.  
All symbols are of usual significance.*

**Answer any four questions from question numbers 1-6 and any two questions from question numbers 7-10**

1. Explain the objectives of analysis of a time-series. Discuss the needs for and procedures of making preliminarily adjustments of a time-series before analyzing it. 5
2. Describe how the method of moving averages can be used to determine the nature of trend of time series data. When this method overestimates the trend values? 5
3. Describe the method of link-relatives for estimating seasonality. 5
4. When a time-series is called Weakly Stationary? If  $h$  be the auto-correlation function of a Weakly Stationary process then show that  $h(X_{t+k}, X_t) = h(k)$ . 5
5. Estimate the parameters of an  $AR(1)$  process. 5
6. If a polynomial of degree three is fitted to a time-series which is ready for trend-determination and it is used to determine weighted moving averages, what would be the weights thus obtained? 5
7. (a) Suppose that a fair die is tossed. Let the states of  $X_n$  be  $k$  ( $= 1, 2, 3, 4, 5, 6$ ) where  $k$  (3+2+2)+3 is the maximum number shown in the first  $n$  tosses. Find the transition probability matrix  $P$ ,  $P^2$  and  $P^3$ .  
(b) Calculate  $Pr(X_3 = 6)$ .
8. (a) Distinguish between seasonal and cyclical fluctuations in a time-series data. 4+6  
(b) Discuss the ratio to trend method to measure the seasonal fluctuations.

9. (a) What would be the effect on moving average series if the original series undergo a base and scale change? 3+7
- (b) What is the effect of moving average on the irregular components? If the irregular components  $e_t$  are *i.i.d.* with mean zero and variance unity then find the correlation between consecutive terms of the corresponding moving average  $T_t$  of order  $3p$ .
- 10.(a) What is an Autoregressive process?  $2\frac{1}{2}$
- (b) Distinguish between Moving average and Autoregressive processes.  $2\frac{1}{2}$
- (c) Derive the auto covariance function of an  $AR(1)$  process. Under suitable assumptions show that the process is second order stationary.  $2\frac{1}{2} + 2\frac{1}{2}$

**N.B. :** *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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