Progressive Education Society's
Modern College of Arts, Science & Commerce Ganeshkhind, Pune – 16
(Autonomous)
End Semester Examination: Nov./Dec. 2023
Faculty: Science and Technology
Semester: III

Program: BScGen03 **SET: B**
Program (Specific): General B.Sc. **Course Type: CC**
Class: S. Y. B.Sc. (General) **Max. Marks: 35**
Name of the Course: Discrete Probability Distributions and Time Series
Course Code: 23-ST-231 **Time: 2Hr**
Paper: II

Instructions to the candidate:

1) ***There are 5 questions in the question paper. Write each question on separate page.***
2) ***All questions are compulsory.***
3) ***Figures to the right indicate full marks.***
4) ***Draw a well labelled diagram wherever necessary***
5) ***Use of statistical tables and scientific calculator are allowed.***

Q1) Choose the correct alternative in each of the following: **[1x5=5]**

1) If X ~ NB (3, p) then the distribution is:

a) leptokurtic b) mesokurtic
c) platykurtic d) positively skewed

2) Suppose X = (X_1, X_2, X_3) ~ MD(4,0.5,0.25,0.25) then Cov(X_1, X_2) =:

a) -1 b) -0.35
c) -0.5 d) -0.25

3) Which of the following is not a method of constructing seasonal indices :
a) Simple averages method
b) Ratio to trend method
c) Link relatives method
d) 3-yearly moving average method

4) The multiplicative model of time series with four components assumes that:
a) Any two components operate independently.
b) All the four components operate independently
c) All the four components show dependency in the model.
d) Change in one component does not affect the other component.

5) Mean If X ~ P (m) and X_T ~ P (m) , truncated below at X=0, then

a) P(X=x) > P(X_T =x) b) P(X=x) < P(X_T =x)
c) P(X=x) = P(X_T =x) d) P(X=x) ≤ P(X_T =x)

Q2) a) State whether the following is true or false (Any two) **[1 x 2=2]**

1) Cyclical variations have period less than one year.
2) Suppose $X = (X_1, X_2, X_3, \ldots X_k)$ follows Multinomial distribution then $E(Xi.Xj) = -n(n-1)\, p_i.p_j$
3) A business cycle is an example of seasonal variation.

b) Define/State the following: (Any two) **[1 x 2=2]**

1) Three yearly moving average.
2) Negative Binomial distribution
3) Secular Trend

Q3) Attempt any two from the following: **[2 x 4=8]**

1) Explain the term "Seasonal variations".

2) Derive the mean of Binomial distribution left truncated below at X=0.

3) Mr. B is randomly drawing cards from an ordinary deck of cards. Every time he picks one, you place it back in the deck. You do this 5 times. What is the probability of drawing 1 heart, 1 spade, 1 club, and 2 diamonds?

Q4) Attempt any two from the following **[2x4=8]**

1) Jeevan is appeared for an exam with multiple-choice questions, and his probability of attempting the question with the right answer is 60%. What is the probability that Jeevan gives the third correct answer for the fifth attempted question?

2) Suppose $X = (X_1, X_2, X_3) \sim MD(n, p_1, p_2, p_3)$, then show that multiple correlation coefficient $R_{1.23} = 1$

3) For the following time series, compute 5-yearly moving averages:

t	1	2	3	4	5	6	7	8
Y_t	31	37	39	41	41	39	33	29

Q5) Attempt any two from the following **[5x 2=10]**

1) If $X_T \sim P(m=5)$, truncated below at X=0 . Find
   a) $P(X_T < 3)$
   b) $P(X_T > 5)$

2) Write a short note on Autoregressive AR(1) model.

3) Derive moment generating function of Multinomial distribution and hence obtain E(Xi).

****