

Total No. of Questions :4]

SEAT No. :

**P634**

[Total No. of Pages : 3

**[5315]-113**

**S.Y.B.Sc.**

**STATISTICS**

**ST-211: Discrete Probability Distributions, Time Series and R-Software  
(2013 Pattern) (Semester-I) (Paper-I)**

*Time :2 Hours]*

*[Max. Marks : 40*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

**Q1)** Attempt each of the following:

- A) Choose the correct alternative in each of the following. **[1 each]**
- a) If  $X \rightarrow NB(k,p)$  then  $E(X)$  is:
- |           |              |
|-----------|--------------|
| i) $kpq$  | ii) $kq/p$   |
| iii) $kp$ | iv) $kq/p^2$ |
- b) If  $(X_1, X_2, X_3) \rightarrow MD(n, p_1, p_2, p_3)$  then multiple correlation coefficient  $R_{1,23}$  is
- |           |            |
|-----------|------------|
| i) $+1$   | ii) $-0.5$ |
| iii) $-1$ | iv) $+0.5$ |
- c) Moving averages of period  $k_1$  remove cyclical variations of uniform period  $k_2$  if
- |                     |   |
|---------------------|---|
| i) $k_1$ is even    | ii) $k_1$ is odd                              |
| iii) $k_1 \neq k_2$ | iv) $k_1 = k_2$ or $k_1$ is multiple of $k_2$ |
- B) State whether each of the following is True or False: **[1 each]**
- a) If  $X_T \rightarrow B(n,p)$ , truncated to the left at zero then  $E(X_T) = 0$ .
- b) Cyclical fluctuations represent long term movement in time series.
- c) R - command `rep ( )` is used to generate vector with repetition of elements.

**P.T.O.**

- C) State the moment generating function (m.g.f.) of negative binomial distribution. [1]
- D) State autoregressive model of order one (AR(I)) for the time series  $(t, y_t)$ . [1]
- E) Give the real life situation where multinomial distribution is applicable. [1]
- F) If  $(X_1, X_2, X_3) \rightarrow MD (n, p_1, p_2, p_3)$  then state  $\text{corr} (X_1, X_2)$ . [1]

**Q2)** Attempt any two of the following. [5 each]

- a) If  $(X_1, X_2, X_3) \rightarrow MD (n, p_1, p_2, p_3)$ , obtain marginal distribution of  $X_1$ . Hence find mean and variance of  $X_1$ .
- b) Describe Holt - Winter method for exponential smoothing.
- c) Suppose  $X_T$  is Poisson random variable, truncated to the left at zero. If  $P(X_T = 2) = P(X_T = 1)$  find
  - i)  $E(X_T)$  and ii)  $P(X_T \leq 2)$

**Q3)** Attempt any two of the following. [5 each]

- a) The probability that family prefers tea of certain brand A is 0.25. Find the probability that seventh family in a survey is found to be the fourth family which prefers the tea of brand A. Also find the expected size of survey to get four families which prefer tea of brand A.
- b) Describe the method of moving averages for the estimation of trend.
- c) Give the outputs of the following R-commands:
  - i) 

```
> x = c(11, 13, 10)
> y = c(0, 1, 2)
> data.frame (x, y)
```
  - ii) 

```
> x = 1 : 8
> y = 8 : 1
> x * y
```
  - iii) 

```
> x = 5
> x * x + 2 * 3 * x + 8
```
  - iv) 

```
> x = seq (1, 3, 0.5)
> x
```
  - v) 

```
> x = 41 : 45
> x [-2]
```

**Q4)** Attempt any one of the following.

- a) i) If  $(X_1, X_2, \dots, X_k) \rightarrow MD (n, p_1, p_2, \dots, p_k)$ , obtain probability distribution of  $X_1 + X_2$ . Hence find probability distribution of  $X_3$  given  $X_1 + X_2 = r$ . **[6]**
- ii) Explain cyclical variations and seasonal variations in time series. **[4]**
- b) i) State one R - Command to find minimum, maximum and three quartiles of a vector X simultaneously. **[2]**
- ii) If  $(X_1, X_2, X_3) \rightarrow MD (10, 0.25, 0.5, 0.25)$  then find  $P(X_1 = 6, X_2 = 1)$ . **[2]**
- iii) Compute the quarterly seasonal indices for the following data using method of simple averages. **[6]**

Year	Q1	Q2	Q3	Q4
2010	40	46	43	39
2011	42	45	42	38
2012	46	46	43	36
2013	45	49	50	43

