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F.Y B.Sc. (Computer Science) EXAMINATION, 2018

STATISTICS

Paper I

(Statistical Methods-I)

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) All questions are compulsory.

(ii) Figures to the right indicate full marks.

(iii) Use of non-programmable, scientific calculator and statistical tables is allowed.

(iv) Symbols have their usual meaning unless otherwise stated.

1. (A) Fill in the blanks : [1 each]

(i) Less than cumulative frequency of the last class is

(ii) Mean and standard deviation of a random variable X are 5 and 4 respectively. Then standard deviation of $(4 - 3X)$ is

(iii) The long-term regular movement in a time series is called as

(iv) Karl Pearson's coefficient of correlation lies between and

P.T.O.

(B) Select the most appropriate option for each of the following : [1 each]

(i) For a moderately skewed distribution, if mean is 30 and mode is 36, the median of the distribution is

- (a) 32
- (b) 30
- (c) 28
- (d) 40

(ii) If $X \rightarrow B\left(3, \frac{1}{2}\right)$ and $Y \rightarrow B\left(5, \frac{1}{2}\right)$ and X and Y are independent, then distribution of $X + Y$ is

- (a) $B(8, 1)$
- (b) $B\left(8, \frac{1}{2}\right)$
- (c) $B\left(8, \frac{1}{4}\right)$
- (d) $B\left(5, \frac{1}{2}\right)$

(iii) In a trivariate data, the correlation coefficient between any two variables when the third variable is held constant is called as

- (a) simple correlation coefficient
- (b) multiple correlation coefficient
- (c) partial correlation coefficient
- (d) multiple regression

(iv) If $\mu_3 = -8$ and $\mu_2 = 3$, the distribution is

(a) positively skewed

(b) negatively skewed

(c) platykurtic

(d) symmetric

(C) Attempt each of the following : [2 each]

(i) State additive property of Poisson distribution.

(ii) State any *two* properties of distribution function of a discrete random variable.

(iii) Find the median of the following observations :

61, 62, 63, 62, 63, 64, 62, 64, 60, 65.

(iv) State additive model of time series.

2. Attempt any *four* of the following : [4 each]

(A) Define :

(i) Class limits

(ii) More than cumulative frequency

(iii) Open end class

(iv) An attribute.

(B) State requisites of a good measure of central tendency.

(C) Weight in mg of 20 residuals are given below. Prepare stem and leaf chart :

50 46 31 49 33 42 55 37 36 35 65 57
27 37 42 33 51 46 31 37

(D) Mean hourly salary of 50 employees in a firm is Rs. 88.40. Frequency distribution of salaries of these employees in which some frequencies are missing is given below :

Salary	Frequency
40—60	6
60—80	—
80—100	17
100—120	—
120—140	5

Find the missing frequencies.

(E) Explain absolute and relative measures of dispersion.

(F) Find mean and standard deviation of first 15 natural numbers.

3. Attempt any *four* of the following : [4 each]

(A) Define mode. Describe the procedure to compute mode for grouped frequency distribution.

(B) Explain the concept of skewness of a frequency distribution. State any *two* measures of skewness.

- (C) For a distribution the mean is 10, standard deviation is 3, $\beta_1 = 1$ and $\beta_2 = 3.5$. Obtain first four central moments.
- (D) Given the following distribution function of a r.v. X :

X	$F(x)$
-3	0.04
-2	0.23
-1	0.56
0	0.82
1	0.93
2	1.00

Find :

- (i) Probability mass function (p.m.f.) of X
- (ii) Mean of X .
- (E) State probability mass function of Poisson distribution. State the conditions when binomial distribution can be approximated by Poisson distribution.
- (F) A shooter is hitting at a target. The probability of not hitting the target at any shot is 0.7. What is the probability that the shooter will hit the target at fourth attempt for the first time ? Also find expected number of shots required until the target is hit for the first time.

4. Attempt any *two* of the following : [8 each]

(A) (i) Find number of pairs of observations from the following data :

$$r = -0.4, \Sigma X = 100, \Sigma X^2 = 2250$$

$$\Sigma Y = 100, \Sigma Y^2 = 2250, \Sigma XY = 1900.$$

(ii) Describe the stepwise procedure of fitting $y = ab^x$ using principle of least square.

(B) (i) Let X follow binomial distribution with mean 3 and variance 2.1 :

(1) Find n and p

(2) Find $P(0 < X < 2)$

(3) Find $P(X \geq 2)$.

(ii) Explain concept of multiple correlation coefficient in a trivariate data. State the expression for the multiple correlation coefficient $R_{1.23}$.

(C) (i) Define regression coefficients for a bivariate data. State any *two* properties of regression coefficients.

(ii) In the regression analysis the equations of two lines of regression are :

$$2X + 3Y = 8 \text{ and } 2Y + X = 5 \text{ and variance of X is 4.}$$

Find :

(1) Mean values of X and Y

(2) Coefficient of correlation between X and Y

(3) Standard deviation of Y.

- (D) (i) What is time series ? Explain seasonal variations in a time series.
- (ii) The standard deviation of distribution is 5. What should be the value of fourth central moment in order that the distribution is mesokurtic and leptokurtic ?

5. Attempt any *one* of the following : [16 each]

- (A) (i) Karl Pearson's coefficient of correlation between X and Y obtained from 10 pairs of observations is 0.5. Mean of X and Y are 12 and 15 respectively. Standard deviations are 3 and 4 respectively. While checking it was noticed that one pair of observation was wrongly entered as (16, 9) instead of (26, 18). Calculate correct coefficient of correlation.
- (ii) Write the stepwise procedure of fitting the curve $y = a + bX + cX^2$ using method of least squares.
- (B) (i) Estimate trend using 4 yearly centered moving averages :

Year	Population (in tonnes)
2000	78
2001	73
2002	71
2003	73
2004	75
2005	78
2006	73
2007	77
2008	70
2009	69

(ii) If X_1 , X_2 and X_3 are the variables measured from their means, obtain the equation of regression of X_3 on X_1 and X_2 from the following information :

$$\begin{array}{lll} \sigma_1 = 2.7 & \sigma_2 = 2.4 & \sigma_3 = 2.7 \\ r_{12} = 0.28 & r_{13} = 0.5 & r_{23} = 0.49 \end{array}$$

Also estimate X_3 when $X_1 = 4$ and $X_2 = 6$.