Total No. of Printed Pages: 3

[Time: 1:30 Hours]   [Max. Marks:50]

N. B   1) All questions are compulsory.
            2) Figures to the right indicate full marks.
            3) Use of non-progammable calculator is allowed.

Q.1 (A) Attempt any one: 8

    a) In case of the continuous frequency distribution, show that mode is given
       by the formula

$$mode = l + \frac{h(f_1 - f_0)}{2f_1 - f_0 - f_2}$$

       Where l is lower limit, h is magnitude and f_1 is the frequency of the modal
       class, f_0 and f_2 are the frequencies of the classes preceeding and
       succeeding the modal class respectively.

    b) Prove that the sum of the squares of the deviations of a set of values is
       minimum when taken about mean.

(B) Attempt any one: 7

    c) An incomplete frequency distribution is given as follows

Variable	10-20	20-30	30-40	40-50	50-60	60-70	Total
Frequency	13	30	-	65	-	18	N = 229

       Given that the median value is 46, determine the missing frequencies
       using the median formula.

    d) A cyclist pedals from his house to his railway station at a speed of 10 mph
       and back from the railway station to his house at 15 mph. Find the average
       speed.

Q.2 (A) Attempt any one: 8

    a) Prove that the standard deviation is independent of change of origin.

    b) For two events A and B, prove that
$$P(A \cap B) = P(B). P(A \backslash B), P(B) > 0.$$

(B) Attempt any one: 7

    c) A distribution consists of three components with frequencies 200, 250, 300 having means 25, 10, 15 and standard deviations 3, 4, 5 respectively. Show that mean of combined group is16 and its standard deviation is 7.2 approximate.

    d) If the letters of the word **REGULATIONS** be arranged at random, what is the chance that these will be exactly 4 letters between **R** and **E**.

Q.3 (A) Attempt any one: 5

    a) If A and B are independent events, then prove that A and $\bar{B}$ are also independent.

    b) If F is a distribution function of one-diamensional random variable X, then prove that
$$F(-\infty) = \lim_{n \to \infty} F(x) = 0.$$

(B) Attempt any one : 5

    c) If two dice are thrown, what is the probability that the sum is neither 7 nor 11.

    d) A probability curve $y = f(x)$ has arange from 0 to ∞. If $f(x) = e^{-x}$. Find the mean and variance and the third moment about mean.

Q.4 Choose the correct alternative and rewrite the sentence 10

    (a) Median of the values 8, 20, 50, 25, 15, 30 is...........
        i. 20.5   ii. 50
        iii. 22   iv. 22.5

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(b) Mean deviation is least when taken from.....
     i. Median   ii. Mode
     iii. Mean   iv. Range

(c) From a pack of 52 cards 2 cards can be drawn in.............. ways
     i. 2210   ii. 22100
     iii. 1236   iv. 1326

(d) Let $f(x)$ be the probability density function of a random variable X, where X is defined from a and b then the geometric mean G is given by........

     i. $\log G = \int_a^b \log x \log f(x) dx$

     ii. $\log G = \int_a^b \log x\, f(x)\, dx$

     iii. $\log G = \int_a^b x \log f(x) dx$

     iv. $\log G = \int_a^b \log x^2 f(x) dx$

(e) The rth order moment of the frequency distribution about any point A is given by $\mu_r^l = \ldots\ldots$

i. $\frac{1}{2N} \sum_{i=1}^{n} f_i(x_i - A)^r$ where $\sum_{i=1}^{n} f_i = N$

ii. $\frac{1}{N} \sum_{i=1}^{n} f_i(x_i - A)^{r-1}$ where $\sum_{i=1}^{n} f_i = N$

iii. $\frac{1}{N} \sum_{i=1}^{n} f_i(x_i - A)^r$ where $\sum_{i=1}^{n} f_i = N$

iv. $\frac{1}{N} \sum_{i=1}^{n} f_i(x_i - A)^{r+1}$ where $\sum_{i=1}^{n} f_i = N$