May 2023

B.Sc. (H) MATHEMATICS - VI SEMESTER

BASICS OF STATISTICS (DEMH-603)

Time: 3 Hours   Max. Marks:75

Instructions:
1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Use of calculator is allowed.*

PART -A

Q1 (a) Define the following terms: (1.5)
   1. Probability
   2. Independent events
   3. Mutually exclusive events

(b) Three coin are tossed, find the probability of getting at least 2 heads.   (1.5)

(c) Find the mean of uniform probability distribution: (1.5)

$$f(x) = \frac{1}{n} \quad ; \quad \forall \ x = 1, 2, 3, ---- n$$

(d) Explain merits and demerits of median.   (1.5)

(e) What are the requisites for an ideal measure of the central tendency?   (1.5)

(f) In the asymmetrical distribution mean is 16 and the median is 20, calculate mode.   (1.5)

(g) Differentiate between positive correlation and negative correlation.   (1.5)

(h) If, $f(x) = Ke^{-|x|}$, is a probability density function in $-\infty < x < \infty$. Find the   (1.5)
value of K.

(i) Define the following terms: (1.5)
   1. Binomial probability distribution
   2. Poisson probability distribution
   3. Normal probability distribution

(j) Differentiate between correlation analysis and regression analysis.   (1.5)

PART -B

Q2 (a) Calculate mean, median and mode of the following data: (8)

Marks	No. of Students
Above 0	80
Above 10	77
Above 20	72
Above 30	65
Above 40	55
Above 50	43
Above 60	28
Above 70	16
Above 80	10
Above 90	8
Above 100	0

(b) Calculate mean, standard deviation and variance for the following table giving the   (7)
age distribution of 542 members:

Age in years	No. of members
20-30	3
30-40	61
40-50	132
50-60	153
60-70	140
70-80	51
80-90	2

Q3 (a) Calculate Karl Pearson's coefficient of correlation between x and y for the   (7)
following data:

x	65	66	67	67	68	69	70	72
y	67	68	65	68	72	72	69	71

(b) From the given data obtain two regression equations using the method of least   (8)
square.

X	2	4	6	8	10
y	5	7	9	8	11

Q4 (a) Cards are dealt one by one from a well shuffled pack of playing cards until an ace   (5)
appears. Find the probability that exactly " n " cards are dealt before an ace appears.

(b) An integer is chosen at random from the first 200 positive integers. What is the   (5)
probability that the integer chosen is divisible by 6 or 8 ?

(c) Two integers are selected at random from 1 to 11. If the sum is even, find the   (5)
probability that both the numbers are odd.

Q5 (a) Fit a binomial distribution to following data, when tossing 5 coins: (7)

x	0	1	2	3	4	5
f	2	14	20	34	22	8

(b) A random variable X has the following distribution: (4)

X	-2	-1	0	1	2	3
P(X)	0.1	K	0.2	2K	0.3	K

Find the value of K and hence calculate variance.

(c) If the probability density function of a random variable is given by: (4)

$$f(x) = \begin{cases} K(1 - x^2) & , \quad 0 \le x \le 1 \\ 0 & , \quad elsewhere \end{cases}$$

Find the value of K and hence calculate mean.

Q6 (a) The median and mode of the following wage distribution are known to be Rs. 3350 **(7)** and Rs. 3400 respectively. Find the missing values:

Wages in Rs.	No. of Employees
0-1000	4
1000-2000	16
2000-3000	f_1
3000-4000	f_2
4000-5000	f_3
5000-6000	6
6000-7000	4
Total	230

(8)

(b) Ten competitors in a fashion contest are ranked by three judges in the following orders:

1st	1	6	5	10	3	2	4	9	7	8
2nd	3	5	8	4	7	10	2	1	6	9
3rd	6	4	9	8	1	2	3	10	5	7

Use the correlation coefficient to determine which pair of judges has the nearest approach to common taste in fashion.

Q7 (a) Players A and B throw a pair of dice. A wins if " he throws 6 before B throws 7 " **(8)** and " B if he throws 7 before A throw 6 ". If A begins, show that his chance of winning is $30/61$.

(b) X is normally distributed and the mean of X is 12 and SD is 4. Find out the **(7)** probabilities of following :

(i) $X \geq 20$
(ii) $X \leq 20$
(iii) $0 \leq X \leq 12$.
(Z distribution at 2 is 0.4772 and Z distribution at 3 is 0.4987).

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