

CARMEL COLLEGE OF ARTS, SCIENCE & COMMERCE FOR WOMEN,  
NUVEM-GOA

SEMESTER END EXAMINATION NOVEMBER-DECEMBER 2022

Semester: I OF BSC/BA

Course Title: Probability and Statistics Course Code: GE 01

Total marks:60 Date:30/11/2022 Duration: 2 hours Total No of pages: 03

- Instructions: i) All questions are compulsory  
ii) Figures to the right indicate full marks  
iii) Use of non programmable calculators is allowed.

I. Answer the following.

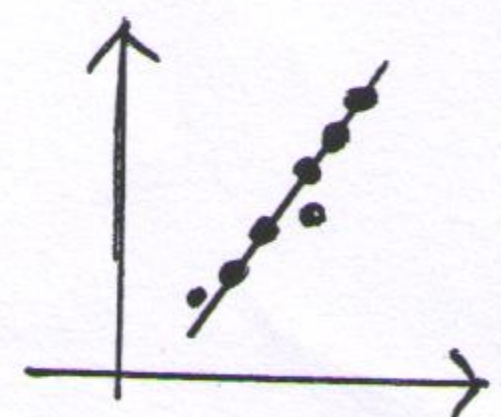
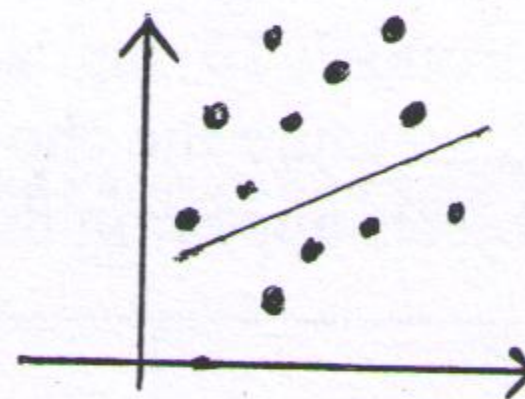
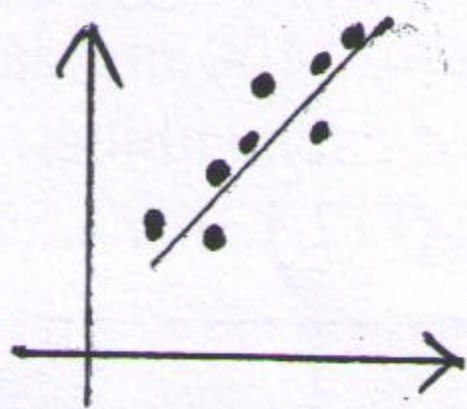
(2x5 = 10)

1. A bag contains 10 lottery tickets with numbers from 1 to 10. 2 tickets are drawn at random. Find the probability that both the tickets have an even number.
2. Let  $E_1$  and  $E_2$  be two events such that  $P(E_1 \cap E_2) = 0.2$ ,  $P(E_1) = 0.4$  and  $P(E_2) = 0.7$ . Find  $P(E_1 \cup E_2)$ .
3. State when two attributes are said to have
  - i. Weak negative correlation
  - ii. Perfect correlation
4. Find equations of regression of 2 attributes x and y, that have both coefficients of regression as 1 and have means 8 and 5 respectively.
5. Consider the experiment of tossing 2 coins. Obtain the probability distribution for the number of heads obtained.

II. Answer of the following.

(2x5 = 10)

1. Define the following terms
  - i. Null hypothesis
  - ii. Alternative hypothesis
2. State 2 limitations of statistics.
3. State the assumptions for ANOVA.
4. A soap opera on T.V. claims a T.R.P. of 4% per week with standard deviation 1%. In a random survey of 30 weeks, it is found that the show had an average T.R.P. of 3.5%. Is the claim of the show justified at 1% level of significance?
5. Sort the following scatter diagrams in ascending order of their extent of correlation



III. A) Answer any one of the following.

(5)

- i Compute Karl Pearson's coefficient of correlation between variables x and y given as follows.

x	5	4	2	5	3	6
y	5	4	1	3	4	5



- ii In a bag there are 10 coins of which 4 coins are of Rs. 5 each, 5 coins are of Rs. 2 each and one coin is of Rs. 1. A person steals a coin from the bag. Find
- The probability distribution
  - Expected value
  - Variance

B) Find Spearman's Coefficient for the following data (5)

R <sub>1</sub>	3	5	2	8	1	6	3	6
R <sub>2</sub>	1	4	6	3	2	8	4	7

IV. A) Answer any one of the following. (5)

- i For the following data, find the lines of regression. Find  $y$  when  $x = 11$

x	2	4	6	8	10
y	-1	-2	-3	2	1

- ii The incomes of a group of 10000 persons were distributed normally with mean Rs. 6000 and standard deviation 100. Find the number of people having income between Rs. 5800 and Rs. 6300. Also find the number of people whose income is less than Rs. 6148.

B) Babloo has two bags. Bag I has 7 red and 2 blue balls and bag II has 5 red and 9 blue balls. Babloo draws a ball at random and it turns out to be red. Determine the probability that the ball was from the bag I. (5)

V. A) Answer any one of the following. (5)

- i A coaching institute claims the average marks of their students to be 58. The number of marks scored by a sample of students from the coaching class are 51, 51, 53, 55, 56, 57, 58, 59, 59, 60. Is their claim justified? (Given  $t = 2.26$ , for 9 d.f. at 5% level of significance)

- ii A pharmaceutical company conducts an experiment to test the effect of a new cholesterol medication. The company selects 15 subjects randomly from a population. Each subject is randomly assigned to one of three treatment groups. Within each treatment group, subjects receive a different dose of the new medication. In Group 1, subjects receive 0 mg/day; in Group 2, 50 mg/day; and in Group 3, 100 mg/day. After 30 days, doctors measure the cholesterol level of each subject. The results for all 15 subjects appear in the table below. ( $F(2,12)=22.59$  at 5% l.o.s)

Group 1	210	240	270	270	300
Group 2	210	240	240	270	270
Group 3	180	210	210	210	240

Does the dosage level have a significant effect on the cholesterol level?



- B) Twelve cars were equipped with radial tires and driven over a test course. Then the same 12 cars were equipped with regular tires and driven over the same course. After each run, the car's gas economy was measured. Is there any evidence that radial tires affect fuel economy?

Car no.	1	2	3	4	5	6	7	8	9	10	11	12
x(radial)	4.2	4.7	6.6	7.0	6.7	4.5	5.7	6.0	7.4	4.9	6.1	5.2
y(belted)	4.1	4.9	6.2	6.9	6.8	4.4	5.7	5.8	6.9	4.7	6.0	4.9

(Given  $t = 2.201$ , for 11 d.f. at 5% level of significance) (5)

VI. A) Answer any one of the following. (5)

- i A company has a head office at Kolkata and a branch in Mumbai. The managing director wanted to know if the workers at the 2 places would like the introduction of a new plan of work and a survey was conducted for this purpose. Out of a sample of 500 workers at Kolkata, 62 favored the new plan. At Mumbai, out of a sample of 400 workers, 59% were in favor of the new plan. Is there any significant difference between the 2 groups in their attitude towards the new plan at 5% level of significance?

- ii From the following data test the hypothesis that the median measure in the population X is less than the median measure in the population Y using Mann-Whitney U test. (Level of significance = 5%,  $U \leq 4$ )

X: 60 45 23 32  
Y: 10 25 54 32 65 08

- B) 256 visual artists were surveyed to find out their zodiac sign. The results were: Aries (29), Taurus (24), Gemini (22), Cancer (19), Leo (21), Virgo (18), Libra (19), Scorpio (20), Sagittarius (23), Capricorn (18), Aquarius (20), Pisces (23). Test the hypothesis that zodiac signs are evenly distributed across visual artists. (5)

Given  $\chi^2 = 19.675$  for 11 d.f. at 5% l.o.s.

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