

## BA &amp; B.SC. CBCS Semester I Examination, January, 2022

**Course name & Code: Probability and Statistics (GE 01)**

Total No. of pages: 04

Instructions: 1. All questions are compulsory, however internal choice is available.  
2. Figures to the right indicate maximum marks allotted to the question.

(5X2mks=10mks)

- Explain the importance and scope of statistics.
- Given the two regression lines as  $x - 2y = 3$  and  $4x + y = 3$ , Find the mean of  $x$  and  $y$ .
- What is a scatter plot? How can a scatter plot be used to determine the correlation between the variables?
- The ranks given by judges to 6 contestant in a beauty contest are given below. Obtain the Spearman's Rank coefficient of correlation.

Rank by judge X	3	1	6	4	2	5
Rank by judge Y	2	3	5	4	1	6

- e. A random variable has the following probability distribution.

X	1	2	3	4	5
P(X)	k	k	4k	k	3k

Find the value of  $k$ . Also, find the expected value of random variable.

- f. The mean and variance of a random variable following binomial distribution is 4 and  $\frac{4}{3}$  respectively. Find number of trials  $n$ , probability of success  $p$  and probability of failure  $q$ .
- g. A card is drawn from a pack of 52 playing cards. What is the probability that it is:
- i) a face card.                      ii) black card

(5X2mks=10mks)

- Find the probability distribution of the number of heads in 2 tosses of a coin.
- A sample of 100 gave a mean of 7.4 kg and a standard deviation of 1.2 kg. find 95% confidence limits for the population mean. (take value of  $z$  for 95% confidence level as 1.96).

- c. Explain the following terms with respect to testing of hypothesis.  
 (i) Level of Significance (ii) Critical Values
- d. Write any four properties of normal distribution.
- e. What are the assumption for the validity of the F-test in ANOVA
- h. If X is a Poisson variate with parameter 2, find  $P(X=2)$ . [Given  $e^{-2} = 0.13533$ ]
- f. A town has two doctors X and Y operating independently. If the probability that Doctor X is available is 0.5 and that for Y is 0.9, what is the probability that at least one doctor is available when needed?
- g. What are Bernoulli trials?

Q.3. Answer the following:

(2X 5mks=10mks)

- a) Answer any one of the following:

(5mks)

- x) The following data gives the marks obtained by 6 students of a class in Statistics and Mathematics. Calculate the Karl Pearson's correlation coefficient and comment on the type of correlation exhibited.

Statistics	50	56	78	78	89	46
Mathematics	65	70	72	82	90	55

OR

- y) The marks secured by the students in two tests X and in Y are given below. Calculate the Spearman's rank coefficient of correlation.

X	10	15	22	17	13	16	24	13	22
Y	30	42	45	45	33	34	40	35	39

- b) Find the equations of regression lines and hence find the most probable value of X when Y is 17. (5mks)

X	12	14	13	15	10	11
Y	30	25	28	20	15	14



Q.4. Answer the following:

(2X 5mks=10mks)

a) Answer any one of the following:

(5mks)

x) Probability of a man hitting the target is  $\frac{1}{3}$ .

- i. If he fires 5 times what is the probability of his hitting the target exactly once.
- ii. What is the probability of hitting the target at least twice?

OR

y) A manufacturing company purchased three new machines of different makes and wishes to determine whether one of them is faster than the others in producing a certain output. Five hourly production figures are observed at random from each machine and results are given below.

Observations	A1	A2	A3
1	31	31	24
2	30	29	30
3	34	38	29
4	38	40	25
5	31	35	22

Use ANOVA and determine whether the machines are significantly different in their mean speed. (Given  $F_{2,12}=3.89$  AT 5% level of significance)

(5mks)

b) Companies A, B and C produce 30%, 45% and 25% of the cars respectively. It is known that 2%, 3% and 2% of these cars produced from A, B and C are defective. If a car is purchased and found to be defective. What is the probability that this car is produced by company C.

Q.5. Answer the following:

(2X 5mks=10mks)

a) Answer any one of the following:

(5mks)

x) A soap manufacturing company was distributing a particular brand of soap through a large number of retail shops. Before a heavy advertisement campaign, the mean sales per shop was 140 dozens. After the campaign, a sample of 10 shops was taken and the

mean sales was found to be 147 dozen with standard deviation 16 dozen. Can you consider the advertisement effective? (Given that  $t_{9}(0.05) = 2.26$ )

OR

y) Ten cartons are taken at random from an automatic filling machine. The mean net weight of the ten cartons is 11.8 oz. and the standard deviation is 0.15 oz. Does the sample mean differ significantly from the intended weight of 12 oz.? (Given that for  $\nu = 9$ ,  $t_{0.05} = 2.26$ )

(5mks)

b) An educator claims that the average I.Q. of college students is at most 110, and that in a study made to test the claim, 150 college students, selected at random, had an I.Q. of 111.2 with a standard deviation of 7.2. Use 1% level of significance to test the claim of the educator

Q.6. Answer the following:

(2x5mks=10mks)

a) Answer any one of the following:

(5mks)

x. The average test marks in a particular class is 79. The standard deviation is 5. If the marks distributed normally, how many students in a class of 200 received marks between 75 and 82 marks? (Given the probabilities as  $P(0 \leq z \leq 0.7) = 0.2580$ ,  $P(0 \leq z \leq 0.6) = 0.2257$ ,  $P(0 \leq z \leq 0.8) = 0.2881$ , where  $z$  is standard normal variate)

OR

y. 20% of the items produced from a factory are defective. Find the probability that in a sample of 5 chosen at random. (i) None is defective (ii) one is defective

(5mks)

b) In a sample of 1,000 people in Maharashtra, 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this State at 1% level of significance?