[Total No. of Questions - 9] [Total No. of Printed P.)s - 4]
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B. Tech 3rd Semester Examination

Probability & Statistics (CBS)

MA-301

Time : 3 Hours **Max. Marks : 60**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all selecting one question from each of the sections A, B, C & D. Question 9 (Section E) is compulsory.

SECTION - A

1. (a) An urn contains 8 white and 3 red balls. If two balls are drawn at random, find the probability that (i) both are white (ii) both are red (iii) one is of each colour. (5)

   (b) The letters of the word 'TRIANGLE' are arranged at random. Find the probability that the word so formed (i) starts with T (ii) ends with E (iii) starts with T and ends with E. (5)

2. (a) A problem in statistics is given to three students A, B and C whose chance of solving it are $\frac{1}{3}, \frac{1}{4}$ and $\frac{1}{5}$ respectively. Find the probability that the problem will be solved if they all try independently. (5)

   (b) A die is tossed twice 'Getting a number less than 3' is termed as success. Obtain the probability distribution and hence the mean and variance of the number of successes. (5)

SECTION - B

3. (a) What is the probability of guessing correctly atleast six of the ten answers in a True-False objective test? (5)

   (b) If 5% of the electric bulbs manufactured by a company are defective, use Poisson distribution to find the probability that in a sample of 100 bulbs (i) none is defective (ii) 5 bulbs will be defective (Given $e^{-5}=0.007$). (5)

4. (a) The Average test marks in a particular class is 79. The standard deviation is 5. If the marks are distributed normally, how many students in a class of 200 did not receive marks between 75 and 82? Given $P_r\ (0 \leq z \leq 0.7) = 0.2580$, $P_r\ (0 \leq z \leq 0.8) = 0.2881$, $P_r\ (0 \leq z \leq 0.6) = 0.2257$ where z is a standard normal variable. (5)

   (b) In a normal distribution, 31% of the items are under 45 and 8% are above 64. Find the mean and standard deviation of the distribution. (5)

SECTION - C

5. (a) Write the Merits and Demerits of Simple Random Sampling. (5)

   (b) A sample of 900 members has a mean 3.4cms and standard deviation 2.61cms. Is the sample from a large population of mean 3.25cms and standard deviation 2.61cms? If the population is normal and its mean is unknown, find the 95% and 98% fiducial limits of true means. (5)

6. (a) A random sample of size 65 was taken to estimate at the mean annual income of 1000 families and the mean and standard deviation were found to be Rs. 6300 and Rs. 9.5 respectively.
   Find a 95% confidence interval for the population. (5)

[P.T.O.]

(b) An I.Q. Test was administered to 5 persons before and after they are trained. The results are given below:

Candidates	:	I	II	III	IV	V
I.Q. Before training	:	110	120	123	132	125
I.Q. After training	:	120	118	125	136	121

Test whether there is any change in I.Q. after the training. It is given that $t_{0.01}=4.6$ for 4 d.f. (5)

SECTION - D

7. (a) In one sample of 8 observations, the sum of the squares of deviation of the sample values from the sample was 84.4 and in other sample of 10 observations it was 102.6. Test wether this difference is significant at 5% level, given that 5% point of F for $n_1=7$ and $n_2=9$ degrees of freedom is 3.29. (5)

(b) A dice is thrown 9000 times and a throw of 3 or 4 observed 3240 times. Show that the dice cannot be regarded as an unbiased one and find the limits between which the probability of a throw of 3 or 4 lies. (5)

8. (a) From the following data, obtain the two regression equations:

Sales:	91	97	108	121	67	124	51	73	111	57
Purchases:	71	75	69	97	70	91	39	61	80	47

(5)

(b) From the following data, calculate the coefficient of rank correlation between x and y.

x:	32	35	49	60	43	37	43	49	10	20
y:	40	30	70	20	30	50	72	60	45	25

(5)

SECTION - E

9. (i) Four cards are drawn at random from a pack of 52 cards. Find the probability that they are a king, a queen, a jack and an ace.

(ii) Explain the meaning of conditional probability of an event.

(iii) There are 3 Engineers and 3 IAS officers. A committee of 3 is to be formed at random. Find the probability that at least one engineer and atleast one IAS officer is in the committee.

(iv) A pair of dice is thrown 4 times. If a doublet is considered a success then find the probability of 2 successes.

(v) If a random variable X has a Poisson distribution s.t. P(X=1)=P(X=2) then find P(X=4).

(vi) Standard error of number of successes is

(a) $\sqrt{npq}$ (b) $\sqrt{\frac{pq}{n}}$ (c) npq (d) $\sqrt{\frac{np}{q}}$

(vii) Define χ^2 test in terms of O and E.

(viii) Write the formula for the difference of two means in case of small samples are tested.

(ix) Prove that the correlation coefficient is the geometric mean between the regression coefficients.

(x) Define regression coefficient. What information do they supply? (10×2=20)