Textile Engg

[Total No. of Questions - 9] [Total No. of Printed Pages - 4]

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MA-301 (Probability & Statistics)
(Common for B.Tech. all Branch)

B.Tech-3rd (CBCS)

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 section A, B, C and D. Section E is compulsory.

SECTION A

1 (a) A pair of dice are thrown by A and B, alternately. A wins the game if he gets a total of 7 and B wins the game if he gets a total of 10. If A starts the game, then find their respective probabilities of winning. (5)

(b) Three numbers are selected at random (without displacement) from first six positive integers. Let X denote the largest of the three numbers obtained. Find the probability distribution of X. (5)

2. (a) State and prove Bayes theorem. (5)

(b) There are two bags. The first bag contains 5 white & 3 black balls and the second bag contains 3 white & 5 black balls. Two balls are drawn at random from first bag and are put into the second bag without noting their colours, then two balls are drawn from the second bag. Find the probability that the balls drawn are white and black. (5)

SECTION B

3. (a) What are Bernoulli Trials? Explain the Binomial probability distribution. (5)

(b) How many times must a man toss a fair coin, so that the probability of having at least one head is more than 80%. (5)

4. (a) Three urns contain respectively 3 green & 2 white balls, 5 green & 6 white balls and 2 green & 4 white balls. One ball is drawn from each urn. Find the probability distribution of the random variables and number of white balls drawn.

(b) If X is a Poisson variable such that P(x=2) = 9P (x=4) + 90P (x=6), Find the mean and variance of X. (5)

SECTION C

5. (a) What do you mean by sampling? Briefly explain various methods of sampling. (5)

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

6. (a) The guaranteed average life of a certain type of electric bulb is 1000 hours with a standard deviation of 125 hours. It is decided to sample the output so as to ensure that 90% of the bulbs do not fail short of the guaranteed average by more than 2.5%. What must be the minimum size of the sample? (5)

(b) A manufacturer claimed that at least 98% of the steel pipe which he supplied to a factory conformed to specification. An exanimate of a sample of 500 pipes revealed that 30 were defective. Test this claim at a significance level of (i) 0-0.5 and (ii) 0-0.01. (5)

SECTION D

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

(b) The following table gives age (x) in years of cares and annual maintenance cost(y) in hundred rupees:

x	1	3	5	7	9
y	15	18	21	23	22

Estimate the maintenance cost for a 4-year-old car after finding the regression equation. (5)

8. (a) A computer manufacturer wants to establish that the average time to set up a new desktop computer is less than 2 hours.

(1) Formulate the null and alternative hypothesis

(2) What error could be made if $\mu = 1.9$? Explain in context of this problem. (5)

(b) Write a short note on test for independence of attributes and goodness of fit. (5)

SECTION E (Compulsory) (10×2=20)

9. (a) Define conditional probability with its expression and limitations.

(b) Sandeep and Salim appear for an interview for two posts. The probability of Sandeep's selection is 3/5 and that of Salim's is 1/3. Find the probability that only one of them will be selected.

(c) Bag I contains 2 white and 3 red balls and bag II contains 4 white and 5 red balls. One ball is drawn at random from one of the bag and found to be red. Find the probability that it was drawn from bag II.

(d) A person plays a game of tossing a coin thrice. For each head he gains Rs.5 and for each tail he loses Rs. 2. Let X denote the amount gained or lost by the person. Show that X is a random variable and exhibit it as a function on the sample space of the experiment.

(e) Find the probability distribution of the number of tails in three tosses of a coin.

(f) For a data set obtain from a sample n= 64, $\bar{x}$ = 24.5, s=3.1. Construct a 95 % confidence interval.

(g) Explain the meaning of point estimation and interval estimation.

(h) What is the standard error of the sample proportion when population proportion is known?

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

(j) Define regression coefficient. What information do they supply?