[Total No. of Questions - 9]   [Total No. of Printed Pages - 4]
(2127)

17067(N)

B. Tech 3rd Semester Examination

Probability and 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 one question from each section. Question no. 9 is compulsory.

SECTION - A

1. (a) In a random arrangement of the letters of the word 'MATHEMATICS', find the probability that all the vowels come together. (5)

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

2. (a) A problem in statistics is given to two students A and B. The odds in favour of A solving the problem are 6 to 9 and against B solving the problem are 12 to 10. If both A and B attempt find the probability of the problem being solved. (5)

   (b) If a random variable X assumes the values 0 and 1 with $p(x=0)=3p(x=1)$, find $V(x)$. (5)

SECTION - B

3. (a) If X is a Poisson variable such that $p(x=2)=9$ $p(x=4)+90p(x=6)$, find the mean and variance of X. (5)

   (b) In a bionomial distribution with 6 independent trials the probability of 3 and 4 successes is found to be 0.2457 and 0.0819 respectively. Find the parameters p and q of the binomial distribution. (5)

4. (a) Assume the mean height of soldiers to be 68.22 inches with a variance of 10.8 inches^2. How many soldiers in a regiment of 1000 would you expect to be (i) overs in feet tall (ii) below 5.5 feet? Assume heights to be normally distributed Given: $Pr(0\leq z\leq1.15)=0.3749$, $Pr(0\leq z\leq0.6756)=0.2501$. (5)

   (b) The marks of the students in a certain examination are normally distributed with mean marks as 40% and standard deviation marks as 20%. On this basis 60% students failed. The result was moderated and 70% students passed. Find the pass marks before and after the moderation. (Ask for Normal table) (5)

SECTION - C

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

   (b) 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 fall short of the guaranteed average by more than 2.5%. What must be the minimum size of the sample? (5)

6. (a) In a random selection of 64 of 600 road crossing in a town, the mean number of automobile accidents per year was found to be 4.2 and the sample standard deviation was 0.8. Construct a 95% confidence interval for the mean number of automobile accidents per crossing per year. (5)

(b) A drug was administered to 10 patients and increments in their blood pressure were recorded to be 6, 3, −2, 4, −3, 4, 6, 0, 0, 2. Is it reasonable to believe that the drug has no effect on change of blood pressure? Use 5% significance level and assume that for 9 degrees of freedom $t_{0.05,9}=2.26$. (5)

SECTION - D

7. (a) In two large populations, there are 30 and 25 percent respectively of fair haired people. Is the difference likely to be hidden in samples of 1200 and 900 respectively from the two populations? https://www.hptuonline.com (5)

(b) If the random variable X is $N(\mu, \sigma^2)$, $\sigma>0$, then show that the random variable $V=\dfrac{(X-\mu)^2}{\sigma^2}$ is $\chi^2(1)$. (5)

8. (a) By using the following data, find out the two lines of regression.

$\Sigma x=900$, $\Sigma y=700$, n=10; $\Sigma x^2=6360$, $\Sigma y^2=2860$ $\Sigma xy=3900$ where x and y are deviations from respective means. (5)

(b) The following data relate to the marks obtained by 10 students of a class in statistics and costing.

Marks in statistics: 30 38 28 27 28 23 30 33 28 35

Marks in costing: 29 27 22 29 20 29 18 21 27 22

Obtain the rank correlation coefficient. (5)

SECTION - E

9. (i) A card is drawn from a well shuffled pack of cards. What is the probability that it is a heart or a queen?

(ii) Distinguish between independent and mutually exclusive events.

(iii) State Bayes's theorem for probability.

(iv) Write the application of Tests of F-distribution.

(v) Give two lines of regression, explain how you will calculate b_{yx} and b_{xy}.

(vi) Distinguish between regression and correlation analysis.

(vii) For the density function $f(x)=\begin{cases} \dfrac{x^2}{9} & , \ 0<x<3 \\ 0 & , \ \text{otherwise} \end{cases}$

Find $P(1 < X < 2)$

(viii) While testing the significance of the difference of two sample means in case of small samples, write the formula for degree of freedom.

(ix) Write the Importance of Normal distribution.

(x) Explain the characteristics of Binomial distribution. (2×10=20)