R07

Code No: V0121

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year II Semester Examinations, April - 2018
PROBABILITY AND STATISTICS
(Common to CE, ME, CHEM, MCT)

Time: 3 hours **Max. Marks: 80**

Answer any five questions
All questions carry equal marks
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1.a) Define sample space, conditional probability and statistically independent events. Prove that if A and B are independent then A^c and B^c are also independent.

b) State Baye's theorem. Two factories produce identical clocks. The production of the first factory consists of 10,000 clocks of which 100 are defective. The second factory produces 20,000 clocks of which 300 are defective. What is the probability that a particular defective clock was produced in the first factory? [8+8]

2.a) A continuous random variable X has a probability density function
$f(x) = 3x^2,\ 0 \le x \le 1.$
Find the values of a and b such that
i) $P\{X \le a\} = P\{X > a\}$ and ii) $P\{X > b\} = 0.05$.

b) Verify that the following is distribution function. Also find $F\left(\frac{a}{2}\right)$:

$$F(x) = \begin{cases} 0, & x < -a \\ \frac{1}{2}\left(\frac{x}{a} + 1\right), & -a \le x \le a. \\ 1, & x > a \end{cases}$$

[8+8]

3.a) Explain binomial distribution. What are its mean and variance? A die is thrown 8 times then find the probability that 3 will show at least two times.

b) The mean score of 1000 students for an examination is 34.4 and S.D. is 16.5. How many candidates can be expected to obtain the marks between 30 and 60 assuming the normality of the distribution? Determine also the limits of the marks of the central 70% of the candidates. [8+8]

4.a) A random sample of size 100 is taken from an infinite population having the mean 66 and variance 225. What is the standard error of the sample mean? Also find the probability that the mean of the sample will lie between 64 and 68.

b) If the population is 2, 3, 6, 8, 11, then (i) list all possible samples of size 2 that can be taken without replacement from the finite population (ii) calculate the mean of each of the sampling distribution of means. (iii) Find the standard deviation of sampling distribution of means. [8+8]

5.a) Explain about: (i) one tail and two-tailed tests (ii) Bayesian estimation and (iii) confidence intervals.

b) Define point and interval estimation. A random sample of size 100 is taken from a population with standard deviation 7.54. Given that the sample mean is 25.6, construct a 95% confidence interval for the population mean μ. [8+8]

6.a) Explain the steps for testing single and difference of means of populations.

b) A random sample of 400 students is found to have a mean height of 171.38 cms. Can it be reasonably regarded as a sample from a large population with mean height 171.17 cm and standard deviation 3.30 cm? [8+8]

7.a) In a certain city A, 100 men in a sample of 400 are found to be smokers. In another city B, 300 men in a sample of 800 are found to be smokers. Does this indicate that there is a greater proportion of smokers in B than A?

b) A drug was administered to 10 patients and the 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? [8+8]

8.a) Explain about pure birth process. Write down the governing equation and show that it follows Poisson law.

b) A departmental store has a single cashier. During the rush hours, customers arrive at the rate of 20 customers per hour. The average number of customers that can be processed by the cashier is 24 per hour. Assuming the conditions for the use of single-channel queuing model, determine: i) Probability that the cashier is idle? ii) Average number of customers in the queueing system? iii) Average time a customer spends in the queue waiting for service? [8+8]

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