JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, March - 2017
PROBABILITY AND STATISTICS
(Common to ME, CSE, AME, MIE, MSNT)

Time: 3 hours
Max. Marks: 75

Answer any five questions
All questions carry equal marks

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1.a) State addition theorem of probability. Three students A, B and C are in a running race. A and B have the same probability of winning the race and each is twice as likely to win as C. Find the probability that B or C wins.

b) State Baye's theorem. A cell phone company uses three different methods to contact its discontinued customers for a reconnection, namely, Telephone contact, sending an email, Approach by the sales executive. It is known from experience that 35%, 25% and 40% are the customers dealt with these three methods. Out of the discontinued customers, 60%, 50% and 70% of the discontinued customers respectively have got reconnection of their cell phones subsequent to the contact. If a randomly selected customer is found to have got his cell phones reconnection recently, what was the probability that he was approached by telephone contact? [7+8]

2.a) Explain normal distribution. If the mean height of sorghum varieties to be 68.22 inches with a variance of 10.8 inches, how many varieties in a field of 100 varieties, would you expect to have 6 feet tall?

b) Define binomial distribution. What are its mean and standard deviation?

c) Explain the sampling distribution of mean ($\bar{X}$), when a sample of size n is taken from a normal population with mean μ and known variance σ^2. [15]

3.a) Explain the terms i) Type I and Type II errors ii) Critical region and iii) confidence interval

b) It is claimed that a random sample of 100 light bulbs with a mean life of 15269 hours drawn from a factory production outlet, which has a mean life of 15200 hours and a standard deviation of 1248. Test the validity of the claim at 5% level of significance. [8+7]

4.a) A manufacturer claims that only 3% of his products are defective. A random sample of 400 was tested among which 100 were defective. Test the claim of the manufacturer at 5% level of significance.

b) In a sample of 300 units of manufactured products, 65 units were found to be defective and in another sample of 200 units there were 35 defectives. Is there any significant difference in the proportion of defectives in the samples at 5% level of significance? [7+8]

5.a) A die is thrown 60 times with the following results:

Face:	1	2	3	4	5	6
Frequency:	7	8	11	9	15	10

Test at 1% level of significance if the die is unbiased, assuming that $p(x^2 > 11.1) = 0.05$ with 5 degrees of freedom.

b) Explain t test for difference of means. Measurements performed on random samples of two kinds of cigarettes yielded the following results on their nicotine content (in mgs):

Brand A   21.4   23.6   24.8   20.9   26.5

Brand B   22.0   27.1   23.5   29.1   24.8

Assuming that the nicotine content is distributed normally, test the hypotheses that brand B has higher nicotine content than brand A.   [7+8]

6.a) i) Explain different types of correlation.

ii) The table below shows the weights of 6 fathers and their eldest sons:

Weight of father(kgs)	76	89	70	103	98	72
weight of son	60	60	105	110	78	68

Calculate correlation between the weights of father and son and comment briefly whether this value supports the theory that weight is an inherited factor.

b) The lines of regression in a bi-variate distribution are $x + 9y = 7$ and $3y + 4x = \dfrac{49}{3}$. Find i) mean of X and Y ii) Coefficient of correlation.   [8+7]

7.a) Explain pure birth process and show that the number of arrivals in a certain time interval follows Poisson process.

b) At a service center users arrive at the counter following a Poisson distribution with an average time of 5 minutes between two successive arrivals. The time taken for a service is on an average 3 minutes and it follows an exponential distribution. What is the probability that the counter is busy? It is proposed to reduce the average waiting time to less than or half of the present waiting time for completion of the service buy establishing a new counter. What has to be the arrival rate so as to warrant the establishment of new counter.   [7+8]

8.a) Describe the classification of the states of Markov process.

b) Define Markov chain, irreducible Markov chain and stochastic matrix. Find the limiting probabilities of the stochastic matrix $P = \begin{bmatrix} 1/3 & 2/3 & 0 \\ 1/2 & 1/2 & 0 \\ 1/3 & 0 & 2/3 \end{bmatrix}$.   [7+8]

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