

Roll No.

Total Pages : 5

307305

December, 2019

B.Tech. (EL/EEE) - III SEMESTER

Mathematics-III (ELBS-321)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

1. It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.
2. Answer any four questions from Part-B in detail.
3. Different sub-parts of a question are to be attempted adjacent to each other.

PART - A

1. (a) If the sum of the mean and variance of binomial distribution of 5 trials is 4.8. Find the distribution. (1.5)
- (b) State and prove Chebyshev's Inequality. (1.5)
- (c) Define Gamma distribution. (1.5)
- (d) Define marginal and conditional probability density function. (1.5)

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(a) If 37 out of 120 patients suffering with certain disease are cured by allopathy and 33 out of 100 patients with same disease are cured by homoeopathy is there reason to believe that allopathy is better than homoeopathy at 0.05 level of significance ($\alpha = 1.842$ at 2% of level of significance)

(b) Fit a second degree parabola in the following data :

x	0	1	2	3	4
y	1	4	10	17	30

(a) From the following table regarding the colour of eyes of father and son, test if the colour of son's eye is associated with that of the father (given chi-square at 0.05 for one degree of freedom = 3.84)

Eye colour in son	Eye colour in father	
	Light	Not light
Eye colour in father	Light	Not light
	79	89

(b) A random sample of size 30 from a normal population has mean 42 and standard deviation of 2. Test the hypothesis that the population mean is 45. Use 5% level of significance

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- (e) Find the moments of exponential distribution about the origin. (1.5)
- (f) State Baye's theorem. (1.5)
- (g) Define Chi-Square test of goodness of fit. (1.5)
- (h) Define Hypothesis testing for Single population mean. (1.5)
- (i) By the method of least square, find the straight line that best fits the following data :

x	1	2	3	4	5
y	14	27	40	55	68

(1.5)

- (j) The first four moments of a distribution about the value '4' of the variable are $-1.5, 7, -30$ and 108 . Discuss the Kurtosis of the distribution. (1.5)

PART - B

2. (a) A bag contains 6 white and 9 black balls, Four balls are drawn at a time. Find the probability for the first draw to give four white and second draw to give four black balls in each of the following cases :
- (i) The balls are replaced before the second draw.
- (ii) The balls are not replaced before the second draw. (7)

- (b) For discrete probability distribution.

x	0	1	2	3	4	5	6	7
f	0	k	2k	2k	3k	k ²	2k ²	7k ² +k

Determine (i) k, (ii) mean, (iii) variance, (iv) smallest value of x such that $P(X \leq x) > \frac{1}{2}$. (8)

3. (a) If the probability density function of a random variables is given by

$$f(x) = \begin{cases} k(1-x^2) & \text{if } 0 \leq x \leq 1 \\ 0 & \text{elsewhere} \end{cases}$$

Find the value of k and the probabilities that a random variable will take on a value (i) between 0.1 and 0.2, (ii) greater than 0.5, (iii) Mean and (iv) variance. (7)

- (b) A sample of 100 dry battery cells tested to find the length of life produced the following results :
 $\mu = 12$ hours, $\sigma = 3$ hours

Assuming the data to be normally distributed, what percentage of battery cells are expected to have life :

- (i) more than 15 hours
- (ii) between 10 and 14 hours. (8)

4. The joint probability distribution of X and Y is given in the following table.

Y X	1	3	9
2	1/8	1/24	1/12
4	1/4	1/4	0
6	1/8	1/24	1/12

- (a) Find the marginal probability distribution of Y.
 (b) Find the conditional distribution of Y given X=4.
 (c) Find covariance of X and Y.
 (d) Are X and Y independent? (15)

5. (a) A car hire firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as poisson distribution with mean 1.5. Calculate the proportion, of days on which (i) neither car is used, (ii) some demand is refused. (7)
 (b) Calculate the coefficient of correlation between the age of husband and wife from the following data :

Age of husband	35	34	40	43	56	20	38
Wife	32	30	31	32	53	20	33

(8)

6. (a) If 57 out of 150 patients suffering with certain disease are cured by allopathy and 33 out of 100 patients with same disease are cured by homeopathy, is there reason to believe that allopathy is better than homeopathy at 0.05 level of significance ($z = 1.645$ at 5% of level of significance). (7)

- (b) Fit a second degree parabola in the following data :

x	0	1	2	3	4
y	1	4	10	17	30

(8)

7. (a) From the following table regarding the colour of eyes of father and son, test if the colour of son's eye is associated with that of the father (given chi- square at 0.05 for one degree of freedom = 3.84)

		Eye colour in son	
		Not light	Light
Eye colour in father	Not light	50	89
	Light	79	782

(7)

- (b) A random sample of size 20 from a normal population has mean 42 and standard deviation of 5. Test the hypothesis that the population mean is 45. Use 5% level of significance. (8)