

**B.Tech. Civil (Construction Management) /  
B.Tech. Civil (Water Resources Engineering) /  
B.Tech. (Aerospace Engineering) /  
BTCLEVI / BTMEVI / BTELVI / BTECVI / BTCSVI  
Term-End Examination**

**December, 2017**

00197

**ET-101(B) : MATHEMATICS – II  
(PROBABILITY AND STATISTICS)**

*Time : 3 hours*

*Maximum Marks : 70*

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**Note :** *All questions are compulsory. Use of calculator is allowed. Use statistical tables wherever necessary.*

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1. Answer any **six** of the following :  $6 \times 5 = 30$

- (a) A bag contains 6 white and 4 black balls and a second bag has 4 white and 8 black balls. One of the bags is chosen at random and two balls are drawn from it. Find the probability that one is white and the other is black.
- (b) A class has 10 boys and 5 girls. Three students are selected at random, one after the other. Find the probability that (i) the first two are boys and the third is a girl, (ii) the first and third are boys and the second is a girl.

- (c) Bag I contains 4 white and 3 black marbles and bag II contains 3 white and 5 black marbles. One marble is drawn from bag I and placed unseen in bag II. Determine the probability that a marble now drawn from bag II is black.
- (d) An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of accident is 0.01, 0.03 and 0.15 respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter driver ?
- (e) Three machines A, B and C produce 50%, 30% and 20% respectively of the total number of items of a factory. The percentage of defective output of these machines are 3%, 4% and 5%. If an item is selected at random, find the probability that the item is defective.
- (f) Suppose that  $D$ , the daily demand for an item, is a random variable with the following probability distribution :

$d :$	1	2	3	4	5
$P(D = d) :$	0.1	0.1	0.3	0.3	0.2

Compute the  $E(D)$  and  $V(D)$ .

- (g) Assuming that half of the population is consumers of chocolate, so that the chance of an individual being a consumer is  $1/2$  and assuming that each of the 100 investigators takes 10 individuals to see whether they are consumers. How many investigators would you expect to report that three people or less were consumers ?
- (h) A certain screw making machine produces on an average 2 defective screws out of 100 and packs them in tin boxes of 500. Find the probability that a box contains 15 defective screws.

2. Answer any *two* of the following :  $2 \times 10 = 20$

- (a) A sample of 100 dry cells tested to find the length of their life, produced the following results :

$\bar{x} = 12$  hours, S.D. = 3 hours.

Assuming the data to be normally distributed, what percentage of cells are expected to have life (i) more than 15 hours, (ii) less than 6 hours, and (iii) between 10 and 14 hours.

- (b) Out of 10000 babies born in a particular month in Delhi, 5200 are male babies. Taking this to be a random sample of births in Delhi, show that it throws considerable doubt on the hypothesis that the sexes are born in equal proportion.

- (c) In a big city two samples are drawn. In one sample of size 100 the average income of persons is ₹ 210 and S.D. is 10 and in the other sample of size 150 persons, the average income is ₹ 220 and S.D. is 12. Also given is that the S.D. of the income of the people of the city is ₹ 11. Test if there is any significant difference between the two average incomes.

3. Answer any *two* of the following : 2×10=20

- (a) A sample of 10 boxes of chips is drawn in which the mean weight is 490 g and the standard deviation of weight is 9 g. Can the sample be considered to have come from a population having mean weight 500 g ?
- (b) Apply  $\chi^2$  test to ascertain if Poisson distribution can be assumed from the following data :

No. of defects	0	1	2	3	4	5
Frequency	6	13	13	8	4	3

- (c) Use normal approximation to compute the probability  $P(6 \leq X \leq 10)$ , where X follows Poisson distribution with parameter  $\lambda = 9$ .