

B.Tech. Civil (Construction Management) /
B.Tech. Civil (Water Resources Engineering) /
B.Tech. (Aerospace Engineering) /
BTCLEVI / BTMEVI / BTELVI / BTECVI / BTCSVI

Term-End Examination

00612

December, 2016

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

Time : 3 hours

Maximum Marks : 70

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

1. Answer any **six** of the following : **6×5=30**

- (a) Three salesmen, A, B and C, have been given a target of selling 10000 units of a particular product, the probabilities of achieving their targets being respectively 0.25, 0.30 and 0.50. If these three salesmen try to sell the product, find the probability of success of only one salesman and failure of the other two.

- (b) Two computers, A and B, are to be marketed. A salesman who is assigned the job of finding customers for them has 60% and 40% chances respectively of succeeding in case of computers A and B. The computers can be sold independently. Given that he was able to sell at least one computer, what is the probability that the computer A has been sold ?
- (c) A product is assembled from two components, A and B. The probability of component A being defective is 0.03 and the probability of component B being defective is 0.02. What is the probability that the assembled product will not be defective ?
- (d) A problem in business statistics is given to 5 students, A, B, C, D and E. Their chances of solving it are $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$ and $\frac{1}{6}$ respectively. What is the probability that the problem will be solved ?
- (e) A letter is chosen at random from the word 'PROFESSOR'.
- (i) What is the probability that it is a vowel ?
 - (ii) What is the probability that it is 'S' ?

- (f) In a bolt factory, machines B_1 , B_2 and B_3 manufacture 25, 35 and 40 percent of the total output respectively. Of their outputs, 5, 4 and 2 percent, respectively are defective bolts. A bolt is chosen at random and found to be defective. What is the probability that the bolt came from machine B_3 ?
- (g) A manufacturer produces IC chips, 1% of which are defective. Find the probability that in a box containing 100 chips, no defectives are found.
- (h) A marksman can hit a target 2 out of 3 times. In 4 shots, what are his chances of hitting it 0, 1, 2, 3 or 4 times ?

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

- (a) A manufacturing company finds that 10 percent of its tools turn out to be defective in the production process. Find the probability that in a sample of 20 tools chosen at random, exactly 4 will be defective.
- (b) Suppose in a normally distributed population, the average income per household is ₹ 10,000 per month, with the standard deviation of ₹ 800. A survey based on a random sample of 100 households is undertaken. What is the probability that the sample mean will be between ₹ 9,800 and ₹ 10,100 ?

- (c) A random sample of 100 students belonging to a college was taken. It was found that the mean height of these students was 168.75 cm. What should be the confidence intervals for estimating the mean height of the entire population of students at (i) 90%, and (ii) 99%, assuming the population standard deviation as 7.5 cm ?

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

- (a) A company is considering two different television advertisements for promotion of a new product. The management believes that advertisement A is more effective than advertisement B. Two test market areas with virtually identical consumer characteristics are selected. Advertisement A is used in one area and advertisement B in the other area. In a random sample of 60 customers who saw advertisement A, 18 tried the product. In a random sample of 100 customers who saw advertisement B, 22 tried the product. Does this indicate that advertisement A is more effective than advertisement B, if a 5% level of significance is used ?

- (b) A survey of 200 firms found the following evidence regarding productivity and market share :

Productivity	Market Share			Total
	up to 10%	11 – 25%	> 25%	
Low	36	14	16	66
Medium	26	22	16	64
High	16	24	30	70
Total	78	60	62	200

Do you find that the above data gives you significant evidence to conclude that market share and productivity are related ? Test the hypothesis at 0.01 level of significance.

- (c) Metal conduits of 2 inch outer diameter are required by a construction company. To test whether the conduits procured by the company have the specified outer diameter, the following data on the outer diameter of 20 randomly selected conduits pieces are given :

1.97 2.09 2.24 3.17 1.01 2.87 1.34 1.79
 3.89 4.16 3.01 1.62 2.81 3.10 2.59 2.75
 1.10 0.57 2.05 1.67

Using the data perform an appropriate test at 5% level of significance.