

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

June, 2017

00722

**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) An urn contains 5 white, 3 black and 2 red balls. If 3 balls are drawn at random, find the probability that (i) all 3 are white, (ii) all 3 are black, (iii) 2 are white and 1 is red, and (iv) 2 are black and 1 is red.
- (b) An MBA applies for a job in two firms, X and Y. The probability of his being selected in firm X is 0.7 and of being rejected in firm Y is 0.5. The probability of his rejection by at least one firm is 0.6. What is the probability that he will be selected in one of the firms ?

- (c) 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 ?
- (d) Suppose that a vacuum tube may come from any one of three manufacturers with probabilities $P_1 = 0.25$, $P_2 = 0.50$ and $P_3 = 0.25$. The probabilities that the tube will function during a specified period of time equal 0.1, 0.2 and 0.4 respectively for the three manufacturers. Compute the probability that a randomly chosen tube will work for the specified period of time.
- (e) Three urns A, B and C contain 6 red and 4 black balls, 2 red and 6 black balls and 1 red and 8 black balls respectively. An urn is chosen at random and a ball is drawn from the urn. If the ball drawn is red, find the probability that the ball was drawn from urn A.
- (f) The probability that a man aged 60 will live up to 70 is 0.65. What is the probability that out of 10 men, now at 60, at least 7 will live up to 70 ?

- (g) From a box containing 3 white and 5 black balls, 4 balls are transferred into an empty box. From this box, a ball is drawn and is found to be white. What is the probability that out of the 4 balls transferred, 3 are white and 1 black ?
- (h) If the variance of the poisson distribution is 2, find the probabilities for $r = 1, 2, 3, 4$ from the recurrence relation of the Poisson distribution. Also find $P(r \geq 4)$.

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

- (a) In a certain locality, half of the households are known to use a particular brand of soap. In a household survey, sample of 10 households are allotted to each investigator and 2048 investigators are appointed for the survey. How many investigators are likely to report (i) 3 users ? (ii) not more than 3 users ?
- (b) Assuming that the height distribution of a group of men is normal, find the mean and standard deviation, given that 84% of the men have heights less than 65.2 inches and 68% have heights between 62.5 and 65.2 inches.

- (c) Television advertisers by mistake believe that most viewers understand most of the advertising that they see and hear. In this connection, a research study covering 2300 viewers above the age of 20 years was taken. Each viewer looked at 30-second television advertising excerpts. It was found that 1914 viewers misunderstood either the entire excerpt or a part of it. Determine a 95% confidence interval for the proportion of all viewers (of which the sample is representative) that will misunderstand all or part of the television excerpts used in this study.

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

- (a) The divisional manager of a retail chain believes the average number of customers entering each of the five stores in his division weekly is the same. In a given week, the manager reports the following number of customers in the stores :

3000, 2960, 3100, 2780 and 3160

Test the divisional manager's belief at 5% level of significance.

- (b) Two salesmen, A and B are employed by a company. Recently it conducted a sample survey yielding the following data :

	Salesman A	Salesman B
Number of sales	20	22
Average weekly sales (₹ lakhs)	30	25
Standard deviation (₹ lakhs)	10	7

Is there any significant difference between the average sales of the two salesmen ?

- (c) A product is produced in two ways. A pilot test of 64 items from each method indicates that the product of method 1 has a sample mean tensile strength of 106 pounds and a standard deviation of 12, whereas in method 2, the corresponding values are 100 and 10 pounds respectively. Greater tensile strength is preferable. Use an appropriate large sample test at 5% level of significance to test whether or not method 1 is better for processing the product.
-