

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

**□ 1 7 0 0 Term-End Examination**  
**December, 2014**

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

*Time : 3 hours*

*Maximum Marks : 70*

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*Note : All questions are **compulsory**. Use of scientific calculator and statistical tables are allowed.*

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1. Answer any **six** of the following :  $6 \times 5 = 30$
- (a) A bag contains 7 white, 6 red and 5 black balls. Two balls are drawn at random. Find the probability that they will both be white.
- (b) A can hit a target 4 times in 5 shots; B 3 times in 4 shots; and C twice in 3 shots. They fire a volley. What is the probability that at least two shots hit ?

- (c) A bag contains 10 balls, two of which are red, three blue and five black. Three balls are drawn at random from the bag. What is the probability that
- the three balls are of different colours,
  - two balls are of the same colour,
  - all balls are of the same colour ?
- (d) A box A contains 2 white and 4 black balls. Another box B contains 5 white and 7 black balls. A ball is transferred from the box A to the box B, then a ball is drawn from the box B. Find the probability that it is white.
- (e) A class consists of 80 students, 25 of them are girls and 55 boys, 10 of them are rich and the remaining poor, 20 of them are fair complexioned. What is the probability of selecting a fair complexioned rich girl ?
- (f) The probability that a doctor correctly diagnoses a particular illness is 0.7. Given that the doctor makes an incorrect diagnosis, the probability that the patient enters a law suit is 0.9. What is the probability that the doctor makes an incorrect diagnosis and the patient sues ?
- (g) A factory has two machines A and B. Past record shows that machine A produced 60% of the items of output and machine B produced 40% of the items. Further, 2% of the items produced by machine A were defective and 1% produced by machine B were defective. If a defective item is drawn at random, what is the probability that it was produced by machine A ?

- (h) The probability that a married man watches a certain television show is 0.4 and the probability that a married woman watches the show is 0.5. The probability that a man watches the show, given that his wife also does, is 0.7.

Find the probability that

- (i) a married couple watches the show.  
(ii) a wife watches the show given that her husband also does.

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

- (a) A random variable X has the following probability function :

Values of X :

x	0	1	2	3	4	5	6	7
p(x)	0	k	2k	2k	3k	$k^2$	$2k^2$	$7k^2 + k$

- (i) Find k.  
(ii) Evaluate  $P(X < 6)$ ,  $P(X \geq 6)$ ,  
 $P(3 < X \leq 6)$ .  
(iii) Find the minimum value of x so that  
 $P(X \leq x) > \frac{1}{2}$ .
- (b) The probability that a pen manufactured by a company will be defective is  $\frac{1}{10}$ . If 12 such pens are manufactured, find the probability that
- (i) exactly two will be defective.  
(ii) at least two will be defective.  
(iii) none will be defective.

- (c) The mean height of 500 male students in a certain college is 151 cm and the standard deviation is 15 cm. Assuming the heights are normally distributed, find how many students have heights between 120 and 155 cm.

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

- (a) A random sample of 900 members has a mean 3.4 cm. Can it be reasonably regarded as a sample from a large population of mean 3.2 cm and SD 2.3 cm ?

- (b) A filling machine is expected to fill 5 kg of powder into bags. A sample of 10 bags gave the following weights :

4.7, 4.9, 5.0, 5.1, 5.4, 5.2, 4.6, 5.1, 4.6 and 4.7.

Test whether the machine is working properly.

- (c) Ten percent of bolts produced in a factory turn out to be defective. Find the probability that in a sample of 20 bolts chosen at random, exactly two will be defective.