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

Term-End Examination

00173

December, 2018

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) A statistics class for engineers consists of 25 industrial, 10 mechanical, 10 electrical, and 8 civil engineering students. If a person is randomly selected by the instructor to answer a question, find the probability that the student chosen is

   (i) an industrial engineering major,

   (ii) a civil engineering or an electrical engineering major.

   (b) If the probabilities that an automobile mechanic will service 3, 4, 5, 6, 7, or 8 or more cars on any given workday are respectively 0·12, 0·19, 0·28, 0·24, 0·10 and 0·07, what is the probability that he will service at least 5 cars on his next day at work ?

(c) The probability that an Indian industry will locate in Mumbai is 0·7, the probability that it will locate in Chennai is 0·4, and the probability that it will locate in either Mumbai or Chennai or both is 0·8. What is the probability that the industry will locate

  (i) in both cities ?

  (ii) in neither city ?

(d) A fuse box contains 20 fuses, of which 5 are defective. If 2 fuses are selected at random and removed from the box in succession without replacing the first, what is the probability that both fuses are defective ?

(e) According to Consumer Digest, the probable location of PCs in the home are :

Adult bedroom   : 0·03

Child bedroom   : 0·15

Other bedroom   : 0·14

Office room   : 0·40

Other rooms   : 0·28

  (i) What is the probability that a PC is in a bedroom ?

  (ii) What is the probability that it is not in a bedroom ?

(f) 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 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;

(iii) at least 1 person of a married couple will watch the show.

(g) A town has 2 engines operating independently. The probability that a specific engine is available when needed is 0·96.

(i) What is the probability that neither of the engines is available when needed ?

(ii) What is the probability that an engine is available when needed ?

(h) Determine the value c so that each of the following functions can serve as a probability distribution of the discrete random variable X :

$$f(x) = c (x^2 + 4) \text{ for } x = 0, 1, 2, 3.$$

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

(a) In testing a certain kind of truck tyre over a rugged terrain, it is found that 25% of the trucks fail to complete the test run without a blowout. Of the next 15 trucks tested, find the probability that

(i) from 3 to 6 have blowouts;

(ii) fewer than 4 have blowouts;

(iii) more than 5 have blowouts.

(b) The probability that a patient recovers from a delicate heart operation is 0·9. What is the probability that exactly 5 of the next 7 patients having this operation survive ?

(c) The probability that a student pilot passes the written test for a private pilot's license is 0·7. Find the probability that the student will pass the test

(i) on the third try,

(ii) before the fourth try.

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

(a) The probability that a patient recovers from a rare blood disease is 0·4. If 100 people are known to have contracted this disease, what is the probability that less than 30 survive ?

(b) Given that X has a normal distribution with $\mu = 300$, and $\sigma = 50$, find the probability that X assumes a value greater than 362.

(c) A machinist is making engine parts with axle diameter of 0·7 inch. A random sample of 10 parts shows mean diameter 0·742 inch with a standard deviation of 0·04 inch. On the basis of this sample, would you say that the work is inferior ?

———