B.Tech. Civil (Construction Management) /
B.Tech. Civil (Water Resources Engineering)
B.Tech. (Aerospace Engineering)

03605

Term-End Examination

December, 2010

ET-101(B) : MATHEMATICS-II
(Probability & Statistics)

Time : 3 hours   *Maximum Marks : 70*

Note :   *Attempt **any seven** questions. All questions are of equal marks.*

1. (a) Define random experiment, sample space,   4
event, simple event, mutually exclusive
events and give an example in each case.

   (b) If n people are present in a room then what   6
is the probability that no two of them
celebrate their birthday on the same day of
the year ? Ignore the possibility of some one
being born on 29th of Feb.

2. (a) State and prove Baye's Theorem   4

   (b) A bag contains 4 red and 3 blue balls. Two   6
draws of 2 balls each are made. Find the
chance that the first draw gives 2 red balls
and the second draw 2 blue balls, if

   (i) The balls are returned to the bag after
the first draw.

   (ii) The ball are not returned.

3. (a) Define a binomial variate. Find its mean and variance. Describe a situation where binomial model is applicable. **4**

   (b) Find the probability that at the most 5 defective fuses will be found in a box of 200 fuses if experience shows that 2% of such fuses are defective. **6**

4. (a) Define a normal variate. What is its p.d.f ? What are the chief characteristics of a normal probability curve. **4**

   (b) A company has installed 10,000 electric lamps in a metro. If these lamps have an average life of 1000 burning hours with a S.D of 200 hours., assuming normality, what number of lamps might be expected to fail, **6**

   (i) in the first 800 burning hours

   (ii) between 800 and 1200 burning hours.

5. The joint density function of x and y is given by **6**

   $$f(x,y) = \begin{cases} 2\,e^{-(x\,+\,2y)}, & 0<x<\infty, 0<y<\infty \\ 0 & , \text{otherwise} \end{cases}$$

   Find

   (a) $P\{x>, y<1\}$,

   (b) $p\{x<y\}$, and

   (c) $P\{x<a\}$,

   (d) Compute Var (x) where x represents the outcome when we roll a fair dice. Hence compute the variance of the sum obtained when six independent rolls of a fair dice are made. **4**

6. (a) Number of customers who visit a car   5
       dealer's show room on weekend is a random
       variable with mean 18 and S.D. 25 . What
       can be said about the probability that on a
       weekend the customers will be between 8
       and 28 ?

   (b) The number of tourists which can be   5
       adjusted comfortably in a coach is 50. The
       owner, knowing from its past experience
       that on the average only 80% of those
       booked seats will actually join the tour, book
       60 tourists. Compute the probability that
       more than 50 tourists will join the tour.

7. (a) Define an unbiased estimator. Show that   4
       sample mean is an unbiased estimate of the
       population mean. Find its variance also.
       Also check for its consistency.

   (b) A random sample of size n is taken from   6
       geometric distribution with parameter p.
       Find moment estimator and MLE for p. Are
       they same ?

8. (a) In a random sample of 300 accidents in a   6
       city. It was found that 120 were due to poor
       road conditions.   Construct a 90%
       confidence interval for the proportion of
       accidents due to poor road conditions in the
       city.

   (b) Explain the following   4

       (i) Type I and Type II errors.

       (ii) Level of significance and power of a
            test.

9.   (a)   Let p be the probability of rolling a six with   5
a given dice. If the dice is fair then $p = 1/6$.
If 30 sixes were observed in 150 independent
castings with this dice, can we say that dice
is fair ? Use $\alpha = 0.01$.

       (b)   The following are 10 measurements on some   5
characteristic measured by same instrument
by two technicians A and B. Can we say
that B is more consistent than A at 5% level
of significance ?

A	13	15	7	15	5	12	9	3	20	11
B	12	7	2	8	6	9	5	7	6	8

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