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ET-101(B)

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

BTCLEVI/BTMEVI/BTELVI/BTECVI/BTCSVI

Term-End Examination

December, 2011

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 : **6x5=30**

(a) A problem of mechanics is given to three students A, B and C whose chances of solving it are $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved ?

(b) If events A and B are independent and $P(A) = 0.15$, $P(A \cup B) = 0.45$, then find $P(B)$.

(c) A machine contains a component C that is vital to its operation. The reliability of component C is 80%. To improve the reliability of a machine, a similar component is used in parallel to form a system. The machine will work provided that one of these components functions correctly. Calculate the reliability of the system.

(d) India plays two matches each with West Indies and Australia. In any match the probability of India getting points 0,1 and 2 are 0.45, 0.05, and 0.50 respectively. Assuming that the outcomes are independent, find the probability of India getting at least 7 points.

(e) A class consists of 80 students, 25 of them girls and 55 boys. While 10 of them are rich and the remaining poor, it is found that 20 are fair complexioned. What is the probability of selecting a fair complexioned rich girl or a poor boy who is not fair complexioned ?

(f) Suppose the probability for A to win a game against B is 0.4. If A has an option of playing either a "best of 3 games" or a " best of 5 games" match against B, which option should A choose so that the probability of his winning the match is higher? (No game ends in a draw)

(g) The chances that doctor A will diagnose a disease X is 60%. The chances that a patient will die by his treatment after correct diagnosis is 40% and the chances of death by wrong diagnosis is 70%. A patient of doctor A who had disease X, died. What is the chance that his disease was diagnosed correctly ?

(h) Three urns A,B,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.

2. Answer *any two* of the following. **2x10=20**

(a) If 20% of the bolts produced by a machine are defective, determine the probability that out of 4 bolts chosen at random

(i) 1 (ii) zero (iii) at most 2 bolts will be defective.

(b) In a certain factory producing cycle tyres there is a small chances of 1 in 500 tyres to be defective. The tyres are supplied in lots of 10. Using Poisson distribution, calculate the approximate number of lots containing no defective, one defective, and two defective tyres respectively, in a consignment of 10,000 lots.

(c) The diameter of an electric cable is assumed to be continuous random variate with probability density function

$f(x) = 6x(1-x),\ 0 \le x \le 1$

(i) Verify the above is probability density function.

(ii) Also find the mean and variance

3. Answer *any two* of the following. **2x10=20**

(a) The mean life time of a sample of 100 fluorescent light bulbs produced by a company is computed to be 1570 hours with a standard deviation of 120 hours. The company claims that the average life of the bulbs produced by it is 1600 hours. Using the level of significance of 0.05, is the claim acceptable ?

(b) A machinist is making engine parts with axle diameter of 0.70 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 ?

(c) The means of simple samples of sizes 1000 and 2000 are 67.5 cm and 68.0 cm respectively. Can the samples be regarded as drawn from the same population of SD 2.5 cm ?
