

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

**Term-End Examination**

**June, 2013**

**00406**

**ET-101(B) : MATHEMATICS-II**

*Time : 3 hours*

*Maximum Marks : 70*

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*Note : All questions are compulsory. Use of calculator is permitted. Use statistical table wherever necessary.*

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1. Answer *any six* of the following: 6x5=30
- (a) The probability that machine A will be performing a useful function in 5 years time is  $\frac{1}{4}$ , while the probability that machine B will be performing useful function at the end of the same period is  $\frac{1}{3}$ . Determine the probability that
- (i) Both machine will be performing a useful function.
  - (ii) Neither will be performing a useful function.
  - (iii) Only machine B will be performing a useful function.
  - (iv) At least one of the machine will be performing a useful function.

- (b) There are 6 positive and 8 negative numbers. Four numbers are chosen at random, without replacement and multiplied. What is the probability that the product is a positive number ?
- (c) A town has two doctors X and Y operating independently. If the probability that the doctor X is available is 0.9 and that for Y is 0.8, then find out the probability that at least one doctor is available when needed.
- (d) The probabilities of A , B and C, solving a problem are  $\frac{1}{3}$ ,  $\frac{2}{7}$  and  $\frac{3}{8}$  respectively. If all of the three try to solve the problem simultaneously , find the probability that exactly one of them will solve it.
- (e) Let X be the continuously random variable with probability density function

$$f(x) = \begin{cases} kx^2, & -1 < x < 2 \\ 0, & \text{otherwise} \end{cases}$$

- (i) Find the constant 'k'
- (ii) Find  $P(0 < x \leq 1)$
- (f) The overall percentage of failures in a certain examination is 40. What is the probability that out of a group of 6 candidates at least 4 would pass the examination ?

- (g) Suppose the probability for A to win a game against B is 0.4. If there is an option of A 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? Assume that no game ends in a draw.
- (h) A factory manufacturing television has four units A, B, C and D. The units A, B, C and D manufacture 15%, 20%, 30% and 35% of the total output, respectively. It was found that out of their output 1%, 2%, 2% and 3% are defective respectively in the same order. A television is chosen at random from the total output, and found to be defective. What is the probability that it came from the unit D?

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

- (a) In a certain factory producing cycle tyres, there is a small chance 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
- (i) no defective
  - (ii) one defective, and
  - (iii) two defective tyres respectively in a consignment of 10,000 lots.

- (b) 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) 0
  - (iii) at most 2 bolts will be defective.
- (c) The diameter of an electric cable is assumed to be continuous random variable with Probability Density Function (p.d.f)
- $$f(x) = 6x(1-x), 0 \leq x \leq 1,$$
- (i) Verify that the above is a probability density function
  - (ii) find its mean and variance

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

- (a) The nine items of a sample have the following values :
- 45, 47, 50, 52, 48, 47, 49, 53, 51
- Does the mean of these differ significantly from the assumed mean of 47.5? Test at 5% level of significance.
- (b) A random sample of 400 tins of vegetable oil and labelled "5 kg net weight" has a mean net weight of 4.98kg with standard deviation of 0.22kg. Do we reject the hypothesis of net weight of 5kg per tin on the basis of this sample at 1% level of significance?

- (c) The height distribution of a group of 10,000 men is normal with mean 64.5 inch and standard deviation 4.5 inch.

Find the number of men whose height is :

- (i) less than 69 inch but greater than 55.5 inch
  - (ii) less than 55.5 inch, and
  - (iii) more than 73.5 inch.
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