B.Tech. CIVIL ENGINEERING (BTCLEVI)
Term-End Examination
December, 2015

BICEE-020 : RELIABILITY AND OPTIMIZATION OF STRUCTURES

Time : 3 hours   *Maximum Marks : 70*

Note : *Attempt any* ***five*** *questions. All questions carry equal marks. Use of scientific calculator is permitted.*

1. (a)   Differentiate between 10 g normal distribution and binomial distribution.   *4*

    (b)   Let the stress in a member X and the area of section Y be independent random variables, the force Z in the member is given by

    Z = XY.

    It is given that

    $f_x(x) = 1/8$ $0 \le x \le 4$.

    $f_y(y) = 1/9$ $0 \le y \le 9$.

    Determine the PDF (Partial differential function) of Z.   *10*

2. (a) Write down the mathematical expression of probability function of Binomial distribution. Explain Poisson distribution and Gamma distribution. *6*

(b) Discuss the principle of De-Morgan's law. Write the basic axioms of probability. *8*

3. (a) (i) Discuss the first order second moment method (FOSM). *4*

(ii) Explain the Level 2 reliability methods. *4*

(b) What is meant by local minimum, local maximum, and global or absolute minimum in a single variable optimization problem ? *6*

4. (a) Using inverse transformation technique, develop expressions for generating random deviates of Y having following distributions : *10*

(i) Uniform distribution

(ii) Exponential distribution

(b) What is the use of sample size in study of distribution of strength in flexure ? *4*

5. (a) Discuss the Monte-Carlo method. Write its various applications. *8*

(b) (i) What do you mean by slack variable and surplus variable in linear programming problem ? What are they used for ? *3*

(ii) State any four applications of simplex method. *3*

6. (a) Give three reasons why the study of unconstrained minimization methods is important. *4*

   (b) State the iterative approach used in unconstrained optimization. *6*

   (c) List the different random search methods in unconstrained optimization problem. *4*

7. (a) Define independent and mutually exculusive events. Can two events be mutually exculsive and independent simultaneously ? Support your answer with example. *6*

   (b) Write short notes on any *two* of the following : *2×4=8*

   (i) Variable Metric Method

   (ii) Bayes' Theorem

   (iii) Classical Optimization Technique

   (iv) Grid and Random Method