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BICEE-020

B.TECH. (CIVIL ENGINEERING)

(BTCLEVI)

Term-End Examination, 2019

BICEE-020 : RELIABILITY AND OPTIMIZATION OF STRUCTURES

Time : Three Hours] **[Maximum Marks : 70**

Note : Attempt **any seven** questions. **All** questions carry **equal** marks. Use of Scientific Calculator is permitted.

1. Solve by dual simplex method of the following LPP : [10]

   Minimize $f=20x_1+16x_2$

   subject to $x_1 \geq 2.5$

   $x_2 \geq 6$

   $2x_1 + x_2 \geq 17$

   $x_1 + x_2 \geq 12$

   $x_1 \geq 0, x_2 \geq 0$

2. Using simplex method : [10]

   Maximize $z=x_1+2x_2+x_3$

subject to $2x_1 + x_2 - x_3 \leq 2$

$-2x_1 + x_2 - 5x_3 \geq -6$

$4x_1 + x_2 + x_3 \leq 6$

$x_1, x_2, x_3 \geq 0.$

3. Explain with suitable examples the Mante Carlo method for solving the theoretical problems. [10]

4. Write short notes on **any two** of the following : [2x5=10]

   (a) Uncertainties in Reliability Assessment

   (b) First Order Second Moment Method (FOSM)

   (c) Hasofer and Lind Method

5. In a bulb factory, machines A, B and C manufacture 25%, 35% and 40% of the total output respectively, of their outputs 5%, 4% and 2% are defective bolts. A bolt is chosen at random and found to be defective. What will be the probability that the bolt came from machine A, B and C ? [10]

6. A person has undertaken a construction job. The probabilities are 0.65 that there will be a strike, 0.80 that the construction job will be completed on time if there is

no strike, and 0.32 that the construction job will be completed on time if there is a strike. Determine the probability that the construction job will be completed on time.

7. Find the expected value and variance of the following probability distribution : [10]

x	-10	-20	30	75	80
p(x)	1/5	3/20	1/2	1/10	1/20

8. 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 no defective tyres respectively, in a consignment of 10,000 lots.[10]

9. (a) Define and describe the structural reliability with suitable illustration. [4]

(b) Describe any two methods of computing structural reliability. [6]

10. Find the coefficient of correlation for the following values of x and y : [10]

x	1	2	3	4	5
y	2	5	3	8	7

----- x -----