[5254]-23

B.E. (Civil)

STATISTICAL ANALYSIS AND COMPUTATIONAL METHODS IN CIVIL ENGINEERING

(2008 Pattern) (Elective - IV)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from section - I. and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from section - II.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Construct a histogram for the following data and determine mean, median, mode and standard deviation. **[12]**

Class Interval	< 20	20-30	30-40	40-50	50-60	> 60
Frequency	2	30	31	16	19	3

b) Explain civil engineering applications of statistical methods. **[4]**

OR

Q2) a) Draw a histogram for the following data and determine mean, mode, median and standard deviation. **[12]**

Class Interval	0-100	100-200	200-300	300-400	400-500	500-600	600-700
Frequency	32	09	08	05	04	01	03

b) Describe various methods of sampling. **[4]**

Q3) a) Samples of three kinds of materials, subjected to extreme temperature changes, produced the following results. Check if the probability of crumbling is the same for the three kinds of materials at 0.05 level of significance. **[8]**

	Material A	Material B	Material C
Crumbled	41	27	22
Remained Intact	79	53	78

Use the following Chi square Table.

v	3	4	5	6	7
$\alpha = 0.05$	7.8147	9.4877	11.07	12.59	14.067

b) Explain Binomial probability distribution. **[8]**

OR

Q4) a) A set of 5 identical coins is tossed 320 times and the number of heads appearing each time is recorded. The results are given below. Test at the 5% level of significance whether the sample is from a binomial population. **[8]**

No. of heads	0	1	2	3	4	5
Frequency	14	45	80	112	61	8

Use the chi square table given in Q. No. 3a.

b) Explain Poisson Probability distribution. **[8]**

Q5) a) Explain the principle of least squares and derive the least square equations for fitting a straight line. **[8]**

b) Fit an equation of the form $y = ab^x$ to the following data. **[10]**

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.5

OR

Q6) a) Explain linear and multiple regression. **[8]**

b) Determine y at $x = 8.2$ for the following data. **[10]**

x	2	3	4	5	6	7	8	9
y	−14	4	40	100	190	316	484	700

Q7) a) Solve using Gauss Elimination method. [8]

$$x_1 + 2x_2 - x_3 = 3$$
$$3x_1 - x_2 + 2x_3 = 1$$
$$x_1 - x_2 + x_3 = -1$$

b) Solve using Gauss-Seidel method. [8]

$$83x + 11y - 4z = 95$$
$$7x + 52y + 13z = 104$$
$$3x + 8y + 29z = 71$$

OR

Q8) a) Solve using Gauss-Jordan method. [8]

$$2x_1 + 2x_2 + 4x_3 = 18$$
$$x_1 + 3x_2 + 2x_3 = 13$$
$$3x_1 + x_2 + 3x_3 = 14$$

b) Solve using Gauss-Seidel method. [8]

$$2x + y + 4x = 12$$
$$8x - 3y + 2z = 20$$
$$4x + 11y - z = 33$$

Q9) a) Obtain the root of the following equation using bisection method. $\tan x + x = 0$. [8]

b) Explain Newton Raphson method. [8]

OR

Q10) a) Obtain the root of the following equation using False Position Method $xe^x - 3 = 0$. [8]

b) Explain Secant method. [8]

*Q11)*a) Derive the equation for Simpson's 1/3 rule. **[8]**

b) Solve using Gauss Quadrature 3 point formula. **[10]**

$$I = \int_1^2 (x^3 + 1)dx$$

OR

*Q12)*a) Derive the equation for Gauss Quadrature 3 point method. **[8]**

b) Solve using Simpson's 3/8 rule. **[10]**

$$I = \int_0^\pi x \sin x \, dx$$

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