[5154]-23

B.E. (Civil)

STATISTICAL ANALYSIS & COMPUTATIONAL METHODS IN CIVIL ENGINEERING

(2008 Course) (Elective - IV) (401008C) (Semester-II)

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

Instructions to the candidates:

1)   *Answer 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)   *Answers to the two sections should be written in separate books.*

3)   *Neat diagrams must be drawn wherever necessary.*

4)   *Figures to the right indicate full marks.*

5)   *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

6)   *Assume suitable data; if necessary.*

SECTION-I

Q1) a)   The following data show the temperatures of effluent at discharge from a sewage treatment plant. Calculate.   **[12]**

     i)   Sample mean, median, variance and standard deviation.

     ii)   Construct a box-plot for this data and comment on the information in this display.

Temp.	40–42	42–44	44–46	46–48	48–50	50–52	52–54	54–56
No.of observations	1	1	6	3	7	4	1	1

   b)   Enlist various methods of sampling and explain any one.   **[4]**

OR

Q2) a)   Calculate mean, median, variance and standard deviation for the following data. Construct a stem and leaf diagram for this data and comment on it.**[12]**

Range	450–950	950–1450	1450–1950	1950–2450	2450–2950	2950–3450	3450–3950
No. of Observations	7	9	4	0	4	2	1

   b)   Explain applications of statistics in civil engineering.   **[4]**

Q3) a) In a testing center, an experiment needs 1.41cm thick aluminium cylinder. Assume that the thickness of the cylinder has a normal distribution with a mean of 1.41 cm and a standard deviation of 0.01 cm. **[12]**

   i) What is the probability that thickness is greater than 1.42 cm.

   ii) What thickness is exceeded by 95% of the samples.

   iii) What proportion of samples lie between 1.38 cm and 1.44 cm.

Use the standard normal distribution table given below.

Z	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Area	0.00	0.0398	0.0793	0.1179	0.1554	0.1915	0.2257	0.2580	0.2881	0.3159

Z	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9
Area	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452	0.4554	0.4641	0.4713

Z	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
Area	0.4772	0.4821	0.4861	0.4893	0.4918	0.4938	0.4953	0.4965	0.4974	0.4981	0.4987

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   b) State the properties of normal distribution. **[4]**

OR

Q4) a) The compressive strength of samples of concrete can be modelled by a normal distribution with a mean of 6000 kg/cm^2 and a standard deviation of 100 kg/cm^2. **[12]**

   i) What is the probability that a sample's strength is less than 6250 kg/cm^2.

   ii) What is the probability that a sample's strength is between 5800 and 5900 kg/cm^2.

   iii) What strength is exceeded by 95% of the samples.

Use the standard normal distribution table given in Q.3a.

   b) State the properties of binomial and poisson distribution. **[4]**

Q5) a) Find the correlation coefficient for the folloiwng data. **[12]**

x	0.66	1.32	1.98	2.64	3.3	3.96	4.62	3.28	5.94	6.6
y	7.32	12.22	16.34	23.66	28.06	33.39	34.12	39.21	44.21	47.48

b) Explain linear and multiple regression. **[6]**

OR

Q6) a) Using interpolation formula, find f(0.25) for the following data. **[12]**

x	0.1	0.2	0.3	0.4	0.5
f(x)	9.98 33	4.96 67	3.28 36	2.43 39	1.91 77

b) What do you mean by coefficient of correlation. Write the equation to determine it and explain all the terms in it. **[6]**

SECTION-II

Q7) a) Solve the following by Gauss elimination method. **[8]**

$y + z = 2$; $2x + 3z = 5$; $x + y + z = 3$

b) Sovle using Gauss - Seidel metohd (3 iterations) **[8]**

$12x_1 + 3x_2 - 5x_3 = 1$; $x_1 + 5x_2 + 3x_3 = 28$;
$3x_1 + 7x_2 + 13x_3 = 76.$

OR

Q8) a) Sovle the following using Gauss-Jordan method. **[8]**

$x + y + z = 5$; $2x + 3y + 5z = 8$; $4x + 5z = 2$

b) Solve using Gauss-Seidel method (3 iterations). **[8]**

$4x_1 + x_2 - x_3 = 3$; $2x_1 + 7x_2 + x_3 = 19$; $x_1 - 3x_2 + 12x_3 = 31.$

Q9) a) Explain false position method. **[8]**
b) Using bisection method, find the root of $2x - \log_{10} x = 7$. **[8]**

OR

Q10) a) Explain Secant method. **[8]**
b) Find the root of the following equation using Newton-Raphson method. $4x - e^x = 0$. **[8]**

*Q11)*a) Explain simposn's 3/8 method.   **[8]**
    b) Integrate the following using Trapezoidal method.   **[10]**

$$\int_0^\pi \sin x \cdot dx \ ; \ n=10.$$

<div align="center">OR</div>

*Q12)*a) Explain 2 point Gauss-Quadrature method.   **[8]**
    b) Evaluate the following using simpson's 3/8 method.   **[10]**

$$\int_0^{0.6} e^x \, dx \ ; \ n=6.$$

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