[4759] - 23

B.E. (Civil)

STATISTICAL ANALYSIS AND COMPUTATIONAL METHODS IN CIVIL ENGINEERING

(2008 Course) (Elective - IV) (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 o rQ.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 calcualtor and steam tables is allowed.*

6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Three hundred incoming students take mathematics exam consisting of 75 multiple choice questions. The following table gives the distribution of the scores of the exam. Find mean, median, mode and variance. **[10]**

Total scores	5-15	15-25	25-35	35-45	45-55	55-65	65-75
No. of students	2	0	8	36	110	78	66

b) Construct a bar chart for the frequency distribution given below. **[6]**

Class Interval	72-75	75-78	78-81	81-84	84-87	87-90
Frequency	2	1	1	2	1	4

OR

Q2) a) The frequency distribution of heights of 100 students at a university is as follows. Find coefficient of skewness and coefficient of Kurtosis. **[10]**

Height (in)	60-62	63-65	66-68	69-71	72-74
Frequency	5	18	42	27	8

b) Explain in brief various methods of sampling. **[6]**

Q3) a) Vehicles pass through a junction on a busy road at an average rate of 300 per hour. **[6]**

   i) Find the probability that none passes in a given minute.

   ii) What is the expected number passing in 2 minutes.

   iii) Find the probability that this expected number actually pass through in a given 2 minute period.

b) The number of rainy days in the first week of July for a period of 50 years is recorded as given below. **[10]**

No. of rainy days	0	1	2	3	4	5	6	7
No. of years	2	9	15	13	7	3	1	0

Assuming that binomial distribution can be used to model this event, test the goodness of fit for binomial distribution at 5% significance lavel. Use the following chi square distribution table.

degree of freedom $\rightarrow$	7	6	5	4
$\alpha = 0.95$	2.167	1.635	1.145	0.711
$\alpha = 0.05$	14.067	12.592	11.07	9.488

OR

Q4) a) The annual runoff of a stream is modelled by a normal distribution with mean and standard deviation of 5000 and 1000 ha-m respectively. **[10]**

   i) Find the probability that the annual runoff in any year is more than 6500 ha-m.

   ii) Find the probability that it would be between 3800 and 5800 ha-m.

   Use the standard normal distribution table given below.

Z	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
Area	0.2257	0.2580	0.2881	0.3159	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332

b) Fit a Poisson distribution to the following data and test the goodness of fit at 5% significance level. **[6]**

x	0	1	2	3	4	5	6
freq.	275	72	30	7	5	2	1

Use Chi square table given in Q. 3b.

Q5) a) Following table shows the weights in kg, heights in inches and ages in years of 5 boys. Find the least square regression equation of y on X_1 and X_2. Estimate the weight of a boy who is 9 years old and 54 in tall. **[9]**

y-weight	64	71	53	67	55
X_1-Height	57	59	49	62	51
X_2-Age	8	10	6	11	8

b) The following are the measurements of pressure head difference and the corresponding discharge measured by venturimeter. Find the value of discharge when pressure head difference p = 10 cm. **[9]**

P(cm)	1	4	9	16	25
Q(cc/s)	100	200	300	400	500

OR

Q6) a) The following table shows the average temperature and precipitation in a city for the month of July during the years 1989-1998. Find correlation coefficient. **[12]**

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Temp (°F)	78.1	71.8	75.6	72.7	75.3	73.6	75.1	75.3	73.8	70.4
Preci (in)	6.2	3.6	3.4	2.8	1.8	2.8	4.1	2.6	1.2	4.2

b) Using Gauss interpolation formula, find the population in 1935. **[6]**

year	1930	1932	1934	1936	1938	1940
Population in Crores	12	16	21	27	32	40

SECTION - II

Q7) a) Solve the following system of equations by Gauss Elimination method.**[8]**

$3x + y + 2z = 3; 2x - 3y - z = -3; x + 2y + z = 4$

b) Solve the following system of equations using Gauss-seidal iteration method. (3 iterations). **[8]**

$8x - y + z = 18; 2x + 5y - 2z = 3; x + y - 3z = -6$

OR

Q8) a) Solve the following system of equations using Gauss-Elimination method. **[8]**

$10x + y + z = 12; 2x + 10y + z = 13; x + y + 5z = 7$.

b) Solve the following system of equations by Gauss seidal method. (3 iterations) **[8]**

$5x - 2y + z = -4; x + 6y - 2z = -1; 3x + y + 5z = 13$.

Q9) a) Using Bisection method, find the root of $\tan x + x = 0$ upto two decimal places which lies between 2 and 2.1. **[8]**

b) Using Newton Raphson method, find the real root of the equation $x^2 + 4 \sin x = 0$. Correct upto 4 decimal places. Take $x_0 = -1.9$. **[8]**

OR

Q10) a) Find the root of the equation $x \cdot e^x = \cos x$ correct upto 4 decimal places using false position method in the interval $(0,1)$. **[10]**

b) Explain secant method. **[6]**

Q11)a) Find the value of $\int_0^{0.6} e^x \cdot dx$ taking number of intervals equal to 6, correct upto 4 decimal places by Simpson rule. **[8]**

b) A river is 80 feet wide. The depth in feet of the river at a distance x from one bank is given by the following table. Find the area of cross section of the river. **[10]**

x	0	10	20	30	40	50	60	70	80
d	0	4	7	9	12	15	14	8	3

OR

Q12)a) Evaluate $I = \int_0^1 \frac{1}{1+x^2} dx$ taking 7 ordinates. **[8]**

b) Use Gauss Quadrature formula to evalute $I = \int_2^3 \frac{\cos 2x}{1+\sin x} \cdot dx$. **[10]**

✿   ✿   ✿