NOTE:

1.	**Answer question 1 and any FOUR from questions 2 to 7.**
2.	**Parts of the same question should be answered together and in the same sequence.**
3.	**Only Non-Programmable and Non-Storage type Scientific Calculator allowed.**

Time: 3 Hours **Total Marks: 100**

1.

a) Evaluate the function $f = uv^2w^3$, if u=37.1, v=9.87, w=6.052, and absolute errors in u, v, w are a_u=0.3, a_v=0.11, a_w=0.016 respectively.

b) A continuous random variable X has the probability density function $f(x) = 3x^2$, $0 \leq x \leq 1$, find a and b, when

i) $P(X \leq a) = P(X > a)$

ii) $P(X > b) = 0.05$

c) A can hit a target 3 times in 5 shots, 'B' 2 times in 5 shots, 'C' 3 times in 4 shots. They fire a volley. What is the probability that 2 shots hit?

d) The mean wage of a certain group of workers is Rs. 500 and the standard direction, σ is 100. Find what percentage of workers get above Rs. 375.

e) The incidences of occupational disease in an industry are such that the workmen have a 20% chance of suffering from it. What is the probability that out of 6 workmen, 4 or more will contact disease?

f) Find whether the following function is a probability density function?

$$f(x) = \begin{cases} x, & 0 \leq x \leq 1 \\ 2x, & 1 \leq x \leq 2 \end{cases}$$

g) Evaluate the integral $\int_0^1 \frac{1}{1+x^2}\,dx$ by using Simpson's 3/8th rule (divide into six intervals).

(7x4)

2.

a) Find the real root of the equation $x=e^{-x}$, using Newton-Raphson method (correct upto 3 places of decimal).

b) Given $\log_{10}654=2.8156$, $\log_{10}658=2.8182$, $\log_{10}659=2.8189$ and $\log_{10}661=2.8202$, then find the value of $\log_{10}656$.

c) A solid of revolution is formed by rotating about the x-axis, the area between the x-axis, the lines x=0 and x=1, and a curve through the points with the following coordinates:

X	0.00	0.25	0.50	0.75	1.00
Y	1.0000	0.9896	0.9589	0.9089	0.8415

Use the concept of numerical integration to estimate the volume of the solid formed (correct upto 3 decimal places).

(6+6+6)

3.

a) Obtain both the lines of regression ('Y' on 'X' and X on 'Y') from the following data:

X	1	2	3	4	5	6	7	8	9
Y	9	8	10	12	11	13	14	16	15

b) Two hundreds digits were chosen at random from a set of tables. The frequencies of the digits were:

Digits	0	1	2	3	4	5	6	7	8	9	Total
Freq.	18	19	23	21	16	25	22	20	21	15	200

Use χ^2 test to assess the correctness of the hypothesis that the digits were distributed in equal numbers in the tables from which these were taken.

(9+9)

4.

a) Solve the following system of equations by Gauss elimination method (using partial pivoting)
$2x+y+z=10$, $3x+2y+3z=18$, $x+4y+9z=16$.

b) Use Newton's forward formula to obtain the cubic polynomial which takes the following values:

X	0	1	2	3
f(x)	1	2	1	10

(8+10)

5.

a) The number of defects in components turned out by a machine was observed. 50 components were chosen at random and their defects were noted. This information is given in the following table:

Number of defects per components

4	1	2	2	1	3	2	4	2	2
0	1	3	2	4	3	2	1	1	2
2	3	0	2	1	0	1	2	3	2
4	0	2	1	5	1	3	5	2	1
0	2	5	1	3	0	1	3	2	1

Present the Poisson probability distribution of the above data.

b) Let the frequency function $f(x,\theta)=\frac{e^{-\theta}\theta^{x}}{x!}$, where, x can assume only non-negative integer values and the six observed values 6, 11, 4, 8, 7 and 6. Find the maximum likelihood estimate for.

(9+9)

6.

a) Show that for a *Γ(l)* (Gamma(ℓ)) distribution,

$$\frac{Mean-Mods}{\sigma^2}=\frac{1}{l}$$

Estimate the parameter θ in sampling from a Poisson distribution by the method of moments. Suppose the five observations 18, 19, 20, 22, and 25 are taken. Suppose that moment estimate of θ is 20.8.

b) Estimate the parameter θ in sampling from a Poisson distribution by the metod of moments. Suppose the five observations 18, 19, 20, 22 and 25 are taken. Suppose that moment estimate of θ is 20.8.

(10+8)

7.

a) State and prove Central Limit Theorem.

b) Show that the coefficient of correlation r between two variables x and y is given by

$r=\frac{\sigma_x^2+\sigma_y^2-\sigma_{x-y}^2}{2\sigma_x\sigma_y}$, where σ_x^2, σ_y^2, and σ_{x-y}^2 are the variance of x, y and x-y respectively.

(8+10)