



[3863] – 475

T.E. (Biotechnology) (Semester – I) Examination, 2010
COMPUTATIONAL TECHNIQUES AND BIOSTATISTICS
(2008 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answer **any three** questions from Section I and **any three** from Section II.
2) Figures to the **right** indicate **full marks**.
3) Make suitable assumptions **wherever** necessary.

SECTION – I

1. a) Determine the constants “a” and “b” by the least squares method such that $y = ae^{bx}$ fits the following data. 8

x	1	1.2	1.4	1.6
y	40.170	73.196	133.372	243.02

- b) Find the values of “a”, “b” and “c” so that $Y = a + bx + cx^2$ is the best fit to the data. 8

x	0	1	2	3	4
y	1	0	3	10	21

OR

2. a) The following are the results of an experiment on friction of bearings, the speed being constant. Corresponding values of coefficient of friction and temperature are shown in the table. If μ and t are given by the law find the values of “a” and “b”. 8

t	120	110	100	90	80	70
μ	0.0051	0.0059	0.0071	0.0085	0.00102	0.00124

- b) Fit a least square geometric curve of the form $y = ax^b$ to the data. 8

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

P.T.O.



3. a) Applying Lagrange's formula and find a polynomial which approximates the following data. 10

x	-2	-1	2	3
f(x)	-12	-8	3	5

- b) $\Delta^2(x^3)$. Evaluate It. 6

OR

4. a) Given the set of tabulated points (1, -3), (3, 9), (4, 30) and (6, 132). Obtain the value of y when x is 2 using Newton's divided difference formulae. 8

- b) The population of a town in decennial census was as under. Estimate the population for the year 1955 using Newton's interpolation formulae. 8

Year	1921	1931	1941	1951	1961
Population	46	66	81	93	101

(in thousands)

5. a) The velocities of a car running on a straight road at intervals of two minutes are given below. 9

Time (min.)	0	2	4	6	8	10	12
Velocity (km/hr)	0	22	30	27	18	7	0

Apply Simpson's $1/3^{\text{rd}}$ rule to find the total distance covered by the car. Compare with the actual value.

- b) Determine the maximum error in evaluating the integral $\int_0^{\pi/2} \cos x dx$ from 0 to $\pi/2$ by trapezoidal rule using four sub intervals. 9

OR

6. a) A curve is drawn to pass through the points given by the following table. Using Weddle's rule, estimate the area bounded by the curve, the x-axis and the lines $x=1$ and $x=4$. 9

x	1	1.5	2	2.5	3	3.5	4
y	2	2.4	2.7	2.8	3	2.6	2.1

- b) A reservoir discharging water through sluices at a depth "h" below the water surface has a surface area "A" for various values of "h" as given below. If "t" denotes the time in minutes, the rate of fall of the surface is given by $dh/dt = -(48h/A)$. Estimate the time taken for the water level to fall from 14 to 10 ft above the sluices. 9

h (ft)	10	11	12	13	14
A (sq.ft)	950	1070	1200	1350	1530



SECTION – II

- 7. a) Find the least positive root of the equation $\tan x = x$ to an accuracy of 0.001 by Newton-Raphson method. 8
- b) Find the root of the equation $2x = \cos x + 3$ correct to three decimal places by Bisection method. 8

OR

- 8. a) Use the method of Regular falsi to estimate the positive root of the equation $xe^x = 1$ between 0 and 1. 8
- b) Find the real root of the non linear equations $x^2 - y^2 = 3$ and $x^2 + y^2 = 13$ by Newton-Raphson method. 8
- 9. a) What are the essentials of sampling ? 6
- b) Discuss in short about types of bar diagrams. 10

OR

- 10. a) Discuss in detail the methods of Sampling. 8
- b) Discuss in detail on Pictographs and Cartograms with suitable examples. 8
- 11. a) A controlled experiment was conducted to test the effectiveness of a new drug. Under this experiment 300 patients were treated with new drug and 200 were not treated with drug. The results of the experiment are as follows. Use Chi square test and comment on the effectiveness of the drug. For degrees of freedom = 2, the table value at 5% significance level is 5.49. 9

Details	Cured	Condition worsened	No effect
Treated with drug	200	40	60
Not treated with drug	120	30	50

- b) The following table gives the yearly medical expenditure of 80 hostilities of a college. Calculate arithmetic mean, standard deviation and coefficient of



variation of the above data.

9

Expenditure (Rs.)	78-82	73-77	68-72	63-67	58-62	53-57	48-52	43-47	38-42	33-37
No of students	2	6	7	12	18	13	9	7	4	2

OR

12. a) Calculate the median for the following data.

9

Weight (gms)	410-419	420-429	430-439	440-449	450-459	460-469	470-479
No.of apples	14	20	42	54	45	18	7

b) Two laboratories “A” and “B” carry out independent estimates of fat content in ice cream made by a firm. A sample is taken from each batch, halved and the separated halves sent to two laboratories. The fat content obtained by the laboratories are recorded below. Is there a significant difference between the mean fat content obtained by the two laboratories “A” and “B” ? The following “t” extracts are given below.

9

Degrees of freedom	6	7	8	9	10	16	18	20		
5% value of t	1.45	2.36	2.31	2.26	2.23	2.12	2.10	2.09		
Batch No.	1	2	3	4	5	6	7	8	9	10
Lab A	7	8	7	3	8	6	9	4	7	8
Lab B	9	8	8	4	7	7	9	6	6	6