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T.E. Biotechnology Examination, 2011
COMPUTATIONAL TECHNIQUES AND BIOSTATISTICS
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Figures to the **right** indicate **full** marks.*
*2) **Use** of pocket electronic calculator is **allowed.***
*3) Draw a **neat** sketch **wherever** necessary.*
*4) Assume suitable data **if** necessary.*
*5) Answer **any three** questions from Section **I** and **any three** questions from Section **II.***
*6) Answer to the **two** Sections should be written in **separate** answer books.*

SECTION – I

1. a) Find the constants "m" and "c" by least squares method using following data : **8**

Data : P = mW + c :

P	12	15	21	25
W	50	70	100	120

b) Fit a second degree parabola to the following data : **8**

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

OR

2. a) An experiment gave the following values, if "v" and "t" are connected by the relation $v = at^b$, find the best possible values of "a" and "b". **8**

v (ft^3 / min)	350	400	500	600
t (min)	61	26	7	26

P.T.O.

b) Predict the mean radiation dose at an altitude of 3000 ft by fitting an exponential curve to the given data. **8**

Altitude (x)	50	450	780	1200	4400	4800	5300
Dose of radiation (y)	28	30	32	36	51	58	69

3. a) Given the values in the data, evaluate f (9) using Lagrange's formula. **10**

x	5	7	11	13	17
f (x)	150	392	1452	2366	5202

b) Evaluate $\Delta\left(e^{x}\log 2x\right)$. **6**

OR

4. a) Express $y = 2x^3 - 3x^2 + 3x - 10$ in a factorial notation and hence show that $\Delta^3 y = 12$. **6**

b) From the following table, estimate the number of students who obtained marks between 40 and 45. **10**

Marks	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
No. of students	31	42	51	35	31

5. a) The velocity v (Km/min) of a moped which starts from rest is given at fixed intervals of time t (min). Estimate the distance covered in 20 min by Simpson's $1/3^{rd}$ rule. **9**

t	2	4	6	8	10	12	14	16	18	20
v	10	18	25	29	32	20	11	5	2	0

b) Evaluate $\int \frac{dx}{1+x^2}$ in the limits (0, 6) by using Weddle's rule and compare the result with the actual value. **9**

OR

6. a) A solid of revolution is formed by rotating about x-axis, the area between x-axis, the lines x = 0 and x = 1 and a curve through the points with the following coordinates. Estimate the volume of the solid formed using Simpson's rule. **9**

x	0	0.25	0.50	0.75	1.00
y	1	0.9896	0.9589	0.9089	0.8415

b) Evaluate $\int \frac{dx}{1+x^2}$ in the limits (0, 6) by using trapezoidal rule. **9**

SECTION – II

7. a) Using Newton's iterative method, find the real root of $x \log_{10}^{x} = 1.2$ correct to five decimal places. **8**

b) Find the root of the equation $xe^x = \cos x$ using Regula falsi method correct to four decimal places. **8**

OR

8. a) Find a root of the equation $x^3 - 4x - 9 = 0$ using bisection method in four stages. **8**

b) Deduct Newton Raphson's iterative formula to find a root of $\sqrt[k]{N}$ and evaluate $\sqrt[3]{24}$ correct to two decimal places. **8**

9. a) Define Frequency polygon. Explain in detail the methods of drawing a frequency polygon. **8**

b) Write short notes on sub divided bar diagrams by taking an example. **8**

OR

10. a) Write short notes on : **8**
    i) Quota sampling
    ii) Convenience sampling.

b) What are Ratio charts ? Explain the method of constructing ratio charts. List out the uses of ratio charts. **8**

11. a) In experiments on Pea breeding, the following frequencies of seeds were obtained. Theory predicts that the frequencies should be in proportions 9 : 3 : 3 : 1. Examine the correspondence between theory and experiment by using Chi square test. The value of Chi square at 0.005 significance level is given as 7.815 for degrees of freedom v = 3. **10**

Round and yellow	**Wrinkled and yellow**	**Round and green**	**Wrinkled and green**	**Total**
315	101	108	32	556

b) Calculate the mean and standard deviation for the following data : **8**

Size of item	6	7	8	9	10	11	12
Frequency	3	6	9	13	8	5	4

OR

12. a) The following is the frequency distribution of a random sample of weekly earnings of 509 employees. Calculate the average weekly earnings by using : **10**
   i) Direct method
   ii) Step deviation method

Weekly earnings	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
No. of employees	3	6	10	15	24	42	75	90	79	55	36	26	19	13	9	7

b) What do you mean by Chi square test ? Describe the working procedure to test significance and goodness of fit for Chi square test. **8**

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