POST-GRADUATE COURSE
Term End Examination — June, 2022/December, 2022
ZOOLOGY
Paper-6A : QUANTITATIVE BIOLOGY AND BIOTECHNOLOGY

Time : 2 hours]   [Full Marks : 50

Weightage of Marks : 80%

Special credit will be given for precise and correct answer. Marks will be deducted for spelling mistakes, untidiness and illegible handwriting. The figures in the margin indicate full marks.

Use of scientific calculator is strictly prohibited.

1. Answer the following : $9 \times 1 = 9$

    a)   i)   Construct the more-than-type cumulative frequency table and draw the Ogive for the data given below :

Marks	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80
Frequency	3	8	12	14	10	6	5	2

    ii)   Use the following data and choose the correct answer for the problems (p - t) :

    Groups

A	B	C
3	5	7
5	6	9
4	4	8

    Total -   12   15   24

    p)   The correction factor for the mean is (i) 105, (ii) 245, (iii) 321, (iv) 289, (v) 315.

q) The degrees of freedom for errors are (i) 9, (ii) 3, (iii) 2, (iv) 8, (v) 6.

r) Assuming that the correct answer to problem 'p' is (ii), the sum of squares for the groups, (SSG) is (i) 70, (ii) 28, (iii) 51, (iv) 26, (v) 76.

s) In order to test the significance of groups at $\alpha = 0.05$, we would use a table F value of (i) $F_{(0.05, 3, 6)}$ (ii) $F_{(0.05, 3, 2)}$ (iii) $F_{(0.05, 3, 8)}$ (iv) $F_{(0.05, 2, 6)}$ (v) $F_{(0.05, 2, 9)}$.

t) If F_{tab} is $> F_{cal}$, we would conclude that the group means are (i) not significantly different, (ii) significantly different, (iii) no sufficient information.

4 + 5

OR

b) i) In a study of blood groups of male and female, the following data were obtained :

	Male	Female
A	427	317
B	559	412
O	521	367
AB	122	85

Prepare a pie chart on the basis of the above data.

ii) Using raw scores formula, calculate 'r' when, $\sum X = 358 \cdot 7$, $\sum Y = 800 \cdot 9$, $\sum X^2 = 10769 \cdot 49$, $\sum Y^2 = 53623 \cdot 95$, $\sum X \cdot Y = 23950 \cdot 85$ for a sample of 12. Draw your Inference.

4 + 5

2. Answer the following : 9 × 1 = 9

a) With schematic diagram, explain the working function of transmission electron microscope. What are the similarities and differences between TEM and SEM ?

6 + 3

OR

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b) What is cation exchanger in ion exchange chromatography ? How does ion exchange chromatography work ? State two uses of ion exchange chromatography.   2 + 5 + 2

3. Answer *three* questions taking at least *one* from each unit :   6 × 3 = 18

Unit - I

a) What is frequency polygon ? How does bar diagram differ from histogram ?   3 + 3

b) A survey regarding the weight of 45 students of a class was conducted and the following data was obtained. Find the median weight.   6

Weight in Kg	20-25	25-30	30-35	35-40	40-45	45-50	50-55
No. of students	2	5	8	10	7	10	3

c) Calculate the mean and variance of the following data :   6

Class	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70
Frequency	2	3	8	12	16	5	2	2

Unit - II

d) What is blotting ? With diagram, describe different steps involved in Northern blotting.   1 + 5

e) What is the difference between apoptosis and necrosis ? State the distinct role of caspase-3 during apoptosis.   2 + 2 + 2

f) What is the basic difference between flow cytometry and FACS ? How does FACS work ?   3 + 3

4. Answer *two* questions taking at least *one* from each unit :   4 × 2 = 8

Unit - I

a) i) What do you mean by population in statistics ? How does it differ from a sample ?

    ii) With example, clarify continuous and discrete data.   2 + 2

b)   If an unbiased coin is tossed 7 times, then find out the probability of getting exactly 3 heads.   4

Unit - II

c)   What is the process of vitrification ?   4

d)   Define bioinformatics. State the application of bioinformatics.

1 + 3

5.   Answer *two* questions taking at least *one* from each unit : $3 \times 2 = 6$

Unit - I

a)   Explain $Y = a + bX$.   3

b)   Write down the properties of normal distribution curve.   3

Unit - II

c)   What does a dichroic mirror do in fluorescence spectroscopy ?   3

d)   What is stationary phase and mobile phase in chromatography ?

3

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