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(February)

BIOTECHNOLOGY

(Honours)

(**Biostatistics and Biological Techniques**)

Marks : 56

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

Answer Question No. **1** which is compulsory
and *any four* from the rest

1. Answer the following questions : $2 \times 6 = 12$
- (a) What is the difference between a histogram and a line diagram?
 - (b) Why is washing step important while performing ELISA?
 - (c) Differentiate between a colorimeter and a spectrophotometer.
 - (d) For separation of nucleus and mitochondria from a cell homogenate, which centrifugation method will you prefer? Give justification to your answer.

- (e) What are the objectives of classification of biological data?
- (f) Explain the following terms :
Class interval and class limits

2. (a) What roles do buffers play in gel electrophoresis? Differentiate between continuous and discontinuous buffer system. $2+4=6$
- (b) What is the role of a probe in Fluorescence In Situ Hybridization (FISH) technique? 2
- (c) What determines the annealing temperature in a polymerase chain reaction (PCR)? How does it affect the specificity of the PCR reaction? 2
- (d) What is the function of an excitation filter in fluorescence microscopy? 1
3. (a) Explain in brief the mobile phase and stationary phase used in column chromatography. Which of these phases will be eluted first from the column chromatography? $4+1=5$
- (b) Differentiate between Northern and Southern blotting. 2

(3)

(c) A particular exogeneous protein is over-expressed in a cell culture. Which blotting technique is the best suited to confirm the presence of this protein? Explain in brief the process involved in this blotting technique. 1+3=4

4. (a) What is the relation between resolution of a microscope and a numerical aperture? 2

(b) Why is the resolving power of an electron microscope higher than that of a light microscope? 2

(c) State Beer-Lambert law and derive the mathematical expression of the law. 4

(d) What is the major difference between a native PAGE and an SDS-PAGE? Enumerate some of the applications of native PAGE. 3

5. (a) What are the different types of statistical data? Discuss in brief the purposes and importance of tabulation in the process of statistical investigation. 2+3=5

(4)

(b) Determine the missing frequencies from the following frequency table where the arithmetic mean is 35 and total frequency is 51 : 6

<i>Class interval</i>	<i>Frequency</i>
0-10	4
10-20	7
20-30	—
30-40	16
40-50	11
50-60	—
60-70	4

6. (a) Find out the median of the following distribution : 5

<i>Class interval</i>	<i>Frequency</i>
20-25	10
25-30	20
30-35	20
35-40	15
40-45	15
45-50	20

(5)

- (b) Find the standard deviation of the following distribution :

Age	Number of Persons
20–25	170
25–30	110
30–35	80
35–40	45
40–45	40
45–50	35

Also calculate the coefficient of variation. 4+2=6

7. (a) Find the correlation coefficient from the following data : 4

X	Y
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9

- (b) Define conditional probability. What is the probability that all 4 children in a family have birthdays falling on different dates (1 year = 365 days)? 1+3=4
- (c) If A and B are two independent events and $P(A) = \frac{2}{3}$ and $P(B) = \frac{3}{5}$, find $P(A \cap B)$. 3

(6)

8. (a) Define binomial distribution. Medical records show that the probability of an individual with a rare syndrome will be cured is $p = 0.01$. A random sample of 10 persons with this syndrome is selected; find the probability of at least 9 persons that are cured, using binomial distribution. 1+4=5

- (b) A certain diet newly introduced to each of the 12 pigs resulted in the following increase in body weights :

6, 3, 8, -2, 3, 0, -1, 1, 6, 0, 5, 4

Can you conclude that the diet is effective in increasing the weight of pigs? [Given critical values of t at 5% level for 11 degree of freedom is 2.201 and 2.718 for two-tailed test and one-tailed test respectively.] 6
