# 2022

( November )

## 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 : 2×6=12

*(a)* What is the role of Blue Dextran in molecular sieve chromatography?

*(b)* Calculate the RCF generated when a centrifuge with $r_{av} = 5 \cdot 0$ cm is operated at 10000 r.p.m.

*(c)* What is the role of cation exchangers?

*(d)* Why is oil immersion recommended for visualization using 100x objective lens?

(e) Explain the terms primary data and secondary data.

(f) Briefly discuss the purpose of tabulation in the process of statistical investigation.

**2.** (a) Briefly describe the types of light dispersive elements commonly used in spectro-photometers. 6

(b) With the help of a diagram, explain the working principle of an epifluorescence microscope. 5

**3.** (a) Describe how Beer-Lambert law is applied to determine the concentration of an unknown sample. 8

(b) Explain the functions of excitation monochromator and emission monochromator used in fluorimetry. 3

**4.** List the components of a general polymerase reaction and explain their roles. What are the roles of primers in a polymerase reaction? 6+5=11





**5.** (a) Discuss Northern Blotting as a tool for gene expression analysis. 8

(b) Will you choose Western Blotting or ELISA for quantitative detection of protein? Give reasons for your answer. 3

**6.** (a) Calculate the arithmetic mean and mode of the following data : 3+3=6

| *Height of students* (in cm) | *Number of students* |
|---|---|
| 120–130 | 7 |
| 130–140 | 15 |
| 140–150 | 18 |
| 150–160 | 34 |
| 160–170 | 21 |
| 170–180 | 10 |
| 180–190 | 2 |

(b) The following table shows the marks obtained by the students in Biotechnology :

| *Marks* | *Number of students* |
|---|---|
| 0–20 | 5 |
| 20–40 | 12 |
| 40–60 | 15 |
| 60–80 | 19 |
| 80–100 | 9 |

Find the median. 5

**7.** *(a)* Calculate the standard deviation and coefficient of variation from the following data : 4+2=6

| *Urea Nitrogen* (mg/dl) | *Number of Patients* |
|---|---|
| 20–30 | 11 |
| 30–40 | 23 |
| 40–50 | 28 |
| 50–60 | 15 |
| 60–70 | 3 |

*(b)* State addition rule of probability. A bag contains tickets bearing number 1 through 25. Find the probability of its bearing a number which is either even or a multiple of 3. 1+4=5

**8.** *(a)* Medical records show that the probability of an individual with a rare syndrome will be cured is $p = 0 \cdot 01$. A random sample of 10 persons with this syndrome is selected; find the probability of at least 9 persons are cured, using binomial distribution. 4

*(b)* Write a short note on systematic sampling. 2





*(c)* The mean weight of 1000 male students at a certain college is 70 kg and standard deviation is 6 kg. Assuming that the weights are normally distributed, find how many students weigh more than 75 kg. [Given : $P(0 \leq z \leq 0 \cdot 83) = 0 \cdot 2967$] 5

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