**Total No. of Questions :6]**

**P405**

SEAT No. :

[Total No. of Pages :3

**[5115] - 39**

**F.Y.B.Sc. (Vocational)**

**BIOTECHNOLOGY**

**Voc-Biotech: 102: Biophysics & Instrumentation, Mathematics, Statistics and Computers for Biologists**

**(2013 Pattern) (Paper - II)**

*Time : 3 Hours]*            *[Max. Marks :80*

*Instructions to the candidates:*

*1) Answers to the two sections should be written in separate answer book.*

*2) Neat diagrams must be drawn wherever necessary.*

*3) Figures to the right indicate full marks.*

*4) All questions are compulsory.*

### SECTION - I

### (Biophysics and Instrumentation)

**Q1)** Answer the following in short:      **[8]**

     a) State the Lambert's law.

     b) Give one application of density gradient centrifugation.

     c) What are Isotopes? Give one example.

     d) Give any two applications of SDS-PAGE.

**Q2)** Answer ANY FOUR of the following:      **[16]**

     a) Describe the principle and applications of thin layer chromatography.

     b) Differentiate between nephelometry and turbidometry.

     c) Write a short note on dark field microscopy.

     d) Explain paper electrophoresis technique in detail.

     e) Explain the calomel electrode with the help of neat labelled diagram.

*P.T.O.*

*Q3)* Answer ANY TWO of the following: **[16]**

    a) Explain the principle of affinity chromatography. Add a note on its applications.

    b) Describe the principle and working of SEM.

    c) Discuss the role of radioisotopes in biological sciences.

## SECTION - II

### (Mathematics, Statistics and Computer for Biologists)

*Q4)* Answer the following questions in short: **[8]**

    a) If $f(x) = \cos(x^2 + 1)$, find $\dfrac{df}{dx}$.

    b) Evaluate $\lim\limits_{x \to \pi} \dfrac{\cos x}{1 - \cos x}$.

    c) What is search engine?

    d) Define mode.

*Q5)* Answer any four of the following: **[16]**

    a) Evaluate $\displaystyle\int_0^1 \dfrac{3x + 5}{x^2 + x + 1}\, dx$.

    b) If $f(x) = \begin{cases} \dfrac{x^3 - 4x}{x + 2} & \text{if } x \neq -2 \\ 3 & \text{if } x = -2 \end{cases}$; find $\lim\limits_{x \to -2} f(x)$.

    c) Describe the test for goodness of fit with example.

**[5115] - 39**                 **2**

d) What is correlation? Explain -ve correlation with suitable example.

e) Write a note on biological database.

**Q6)** Answer any two of the following: **[16]**

a) i) Find the limit of the sequence

$$\left\{ \frac{2^{n+1} + 3^{n+1}}{2^n + 3^n} \right\}_{n=0}^{\infty}.$$

ii) Discuss the convergence of the series

$$\sum_{n=0}^{\infty} \left( \frac{1}{2} \right)^n.$$

b) i) If $y = \left( e^{x^2} - \sin (\log x) \right) \left( \sqrt{x^3 + 5} \right)$, find $\frac{dy}{dx}$.

ii) Evaluate $\int_0^{\pi/2} \sin^3 x \, dx$.

c) Explain the role and importance of computer in biological sciences.

d) What is mean? Calculate mean, mean deviation and standard deviation from the following data series:

24, 28, 32, 30, 23, 26, 27, 32, 30, 31, 32, 33, 26, 27, 29, 30, 31.

❈❈❈

**[5115] - 39** 3