ADVANCED DIPLOMA IN BIOINFORMATICS (A.D.B.) (CBCS-2019 COURSE)
A.D.B. SEM-I : WINTER :- 2021
SUBJECT: BIOMATHEMATICS

Day : Saturday   Time : 10:00 AM-11:30 AM

Date 29-01-2022   W-21122-2021   Max. Marks: 30

N.B.

    1)   All Questions are **COMPULSORY.**

    2)   Figures to the right indicate **FULL** marks.

    3)   Answer to both the section to be written in **SAME** answer books

    4)   Draw a labeled diagram wherever **NECESSARY**.

SECTION – I

Q.1 a) Attempt any **TWO** of the following :   **(05)**

    i)   Find the centre and radius of the circle $x^2+y^2-2x-6y+2=0$.

    ii)   Find the distance of the point (-2,3) from line $12x = 5y+13$.

    iii)   Find slope and y-intercept of a line $\dfrac{x}{2} - \dfrac{y}{3} = \dfrac{1}{4}$

Q.2 a) Attempt any **TWO** of the following :   **(06)**

    i)   Find acute angle between the lines $x-2y+5=0$ and $7x+y-10=0$.

    ii)   Show that the points (-2,0), (-4, -2 $\sqrt{3}$) and (-6,0) are the vertices of an equilateral triangle. Hence find its area.

    iii)   If $y = \dfrac{e^x - e^{-x}}{e^x + e^{-x}}$ then show that $\dfrac{dy}{dx} = 1 - y^2$.

    iv)   Show that the point (1,1) lies inside circle $x^2+y^2-4x+6y-12=0$

b) Attempt any **TWO** of the following :   **(04)**

    i)   If $y = e^x - \dfrac{1}{x} + \log_e x$ *then find* $\dfrac{dy}{dx}$.

    ii)   Evaluate the limit : $\displaystyle\lim_{x \to 2} \dfrac{x^2 - 4}{x - 5 + \dfrac{6}{x}}$.

    iii)   Evaluate the limit : $\displaystyle\lim_{\theta \to \frac{\pi}{4}} \dfrac{2 - \csc^2\theta}{1 - \cot\theta}$

<div align="right">P.T.O.</div>

SECTION - II

Q.3 Attempt any **TWO** of the following : (05)

i) Show that $A = \begin{bmatrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ -\sin\theta & 0 & \cos\theta \end{bmatrix}$ is an orthogonal matrix.

ii) Find $\dfrac{dy}{dx}$, if $y = \log_a x + \log_x a + (\log x)^a + \log_a a$.

iii) Evaluate : $\displaystyle\lim_{x \to \infty} \left(\dfrac{3x+1}{3x-2} \right)$.

Q.4 a) Attempt any **ONE** of the following : (04)

i) Find the inverse of matrix using adjoint method.

$$B = \begin{bmatrix} 2 & -2 & 3 \\ 3 & -1 & 2 \\ 1 & 2 & -1 \end{bmatrix}$$

ii) Deduce the following matrix into normal form and hence find its rank

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$$

b) Attempt any **TWO** of the following : (06)

i) With the help of one example, explain the use of mathematics in Biology.

ii) Prove that sum of two solution to homogeneous linear differential equation is again solution as it is the product of solution with any constant.

iii) Derive equation of Michaelis - Menten Kinetics.

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