

**M. Sc. Bioinformatics Sem.-I (C.B.C.S.) (2013 Course) / Advanced
Diploma in Bioinformatics Sem.-I (C.B.C.S.) (2013 Course) :
WINTER - 2018**

SUBJECT : ESSENTIAL BIOMATHEMATICS

Day : Monday
Date : 29/10/2018

W-2018-1254

Time : 10.00 AM TO 1:00 P.M.
Max. Marks : 60

N.B.:

- 1) **Q.No.1 and Q.No.5 are COMPULSORY.** Out of the remaining attempt **ANY TWO** questions from each section.
- 2) Answers to both the sections should be written in **SEPARATE** answer books.
- 3) Use of non-programmable **CALCULATOR** is allowed.
- 4) Figures to the right indicate **FULL** marks.

SECTION – I

Q.1 Attempt the following: [10]

- a) If $f(x)$ is continuous at $x = 0$, find value of k , where
$$f(x) = k(x^2 - 2), \quad x \neq 0$$
$$= 1, \quad x = 0$$
- b) Find the order and degree of D.E
$$\left(\frac{d^2y}{dx^2}\right)^2 + \left(\frac{dy}{dx}\right)^3 = e^x.$$
- c) Find cartesian co-ordinates of the point whose polar co-ordinates are $\left(2, \frac{\pi}{6}\right)$.
- d) Find the equation of a line having slope -2 and y-intercept 5.
- e) Find the equation of circle with centre (2, 3) and radius 5.

Q.2 Attempt the following: [10]

- a) If $A, B(3, -2), C(-2, 4)$ are vertices of $\triangle ABC$ and the centroid G lies on the locus $3x^2 - 5y^2 = 15$. Find the equation of the locus of vertex A .
- b) Find p and q , if the equation $2x^2 + 8xy + py^2 + qx + 2y - 15 = 0$ represents a pair of parallel lines.

Q.3 Attempt the following: [10]

- a) Obtain the differential equation by eliminating the arbitrary constants from the equation $y = A\cos(\log x) + B\sin(\log x)$.
- b) Find the co-ordinates of the focus, equation of directrix, length of latus rectum, co-ordinates of end-points of latus rectum and focal distance for parabola $y^2 = 16x$.

Q.4 Attempt the following: [10]

- a) Convert cartesian co-ordinates (2, 2, 3) to cylindrical co-ordinates and spherical co-ordinates.
- b) Find derivative of $\sin^2 3x \cdot \tan^3 2x$ with respect to x .

P.T.O.

SECTION – II

Q.5 Attempt the following: [10]

- a) Find the derivative of $3x^2$ by using first principle.
- b) Define vector and unit vector.
- c) Find the Laplace transform of $f(t) = 5e^{-3t} + e^{4t} + 3t^2 - 8$.
- d) Find the 10th term for G.P. 1, 3, 9, 27,
- e) Construct a matrix $A = [a_{ij}]_{2 \times 2}$ whose element a_{ij} is given by $a_{ij} = i + j$.

Q.6 Attempt the following: [10]

- a) Solve the following equations using Cramer's rule:
$$\begin{aligned} x + y - z &= 2, \\ x - 2y + z &= 3, \\ 2x - y - 3z &= -1 \end{aligned}$$
- b) Find the sum of all natural numbers from 1 to 200 which are divisible by 3.

Q.7 Attempt the following: [10]

- a) Find the Fourier series of the function $f(x) = x^2$.
- b) Find the eigen values of the matrix.

$$\begin{bmatrix} 1 & -3 & 3 \\ 3 & -5 & 3 \\ 6 & -6 & 4 \end{bmatrix}$$

Q.8 Attempt the following: [10]

- a) Explain how mathematics used in population genetics?
- b) Explain with example tumor modeling.

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