

**M. SC. BIOINFORMATICS SEM.-I (C.B.C.S.) (2013 COURSE) /  
ADVANCED DIPLOMA IN BIOINFORMATICS SEM.-I  
(C.B.C.S.) (2013 COURSE) : SUMMER - 2018  
SUBJECT : ESSENTIAL BIOMATHEMATICS**

Day : **Wednesday**  
Date : **11/04/2018**

Time : **10.00 AM TO 11.30 AM**  
Max. Marks : 60

**S-2018-1125**

**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) Evaluate :  $\int_0^4 4x^3 dx$ .
- b) Find the equation of line passing through (2, -2) and having slope 3.
- c) Find the equation of circle in standard form having radius 10.
- d) Find order and degree of D.E.

$$\left(\frac{d^2x}{dt^2}\right) + \left(\frac{dx}{dt}\right)^3 = a^x.$$

- e) Evaluate :  $\lim_{x \rightarrow 0} \frac{a^{3x} - 1}{2x}$ .

**Q.2** Attempt the following: **[10]**

- a) Show that the equation  $2x^2 + xy - y^2 + x + 4y - 3 = 0$  represents a pair of lines. Also, find the acute angle between them.
- b) If the points (-4, 4) and (16, b) lie on the locus  $y^2 = 4a$ , find the values of a and b.

**Q.3** Attempt the following: **[10]**

- a) If  $f(x)$  is continuous at  $x = 3$ , find values of  $\alpha$  and  $\beta$ , where

$$\begin{aligned} f(x) &= \frac{x^2 - 9}{x - 3} + \alpha, \quad x > 3 \\ &= 5, \quad x = 3 \\ &= 2x^2 + 3x + \beta, \quad x < 3 \end{aligned}$$

- b) Reduce the D.E.  $\frac{dy}{dx} = (4x + y + 1)^2$  to the variable separable form by substituting  $4x + y + 1 = v$  and hence solve.

**Q.4** Attempt the following: **[10]**

- a) Find derivative of  $\tan^2(\log x)$  with respect to  $x$ .
- b) Find the co-ordinates of focus, equation of directrix, length of latus rectum, co-ordinates of end-points of latus rectum and focal distance for parabola  $y^2 = 12x$ .

P.T.O.

**SECTION – II**

**Q.5** Attempt the following: **[10]**

- a) Construct a matrix  $A = [a_{ij}]_{2 \times 3}$  whose element  $a_{ij}$  is given by  $a_{ij} = i - j$ .
- b) By first principle, find derivative of  $3x + 2$ .
- c) Find the Laplace transform of  $f(t) = 7e^{4t} + e^{-3t} + 4t^2 - 1$ .
- d) If  $a = 3, d = -2$ , find 7<sup>th</sup> term in A.P.
- e) Define vector and null vector.

**Q.6** Attempt the following: **[10]**

- a) Find the Fourier series of the function  $f(x) = x^2$ .
- b) In  $\triangle ABC$ , if  $D, E, F$  are mid points of sides  $BC, CA$  and  $AB$  respectively, show that  $\overline{AD} + \overline{BE} + \overline{CF} = \overline{0}$ .

**Q.7** Attempt the following: **[10]**

- a) Find the eigen values of the matrix

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

- b) Solve the following equations using Cramer's rule.  
 $x + 2y + 3z = 6,$   
 $2x + 4y + z = 7,$   
 $3x + 2y + 9z = 14$

**Q.8** Attempt the following: **[10]**

- a) Explain enzyme kinetics in brief.
- b) Explain any one algorithm utilized partial differentiation in biology.

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