[30/ A-2]

SARDAR PATEL UNIVERSITY
M. Sc. Integrated Biotechnology (IGBT) 1st Semester
PS01CIGB06 – Biomathematics
28th October, 2016 (Friday)
Time: 10:00 am to 1:00 pm

Note: 1) All the Questions are compulsory.
2) Figures on the right indicate marks.   **Maximum Marks: 70**

Q.1   Choose the correct option.   [8]

(1) If f : A → B is a function then B is called...........................
   (a) Domain   (b) Inverse   (c) Codomain   (d) None of these

(2) The smallest set A such that A ∪ {1, 3} = {1, 2, 3, 5, 9} is ....
   (a) {2,3,5}   (b) {2,5,9}   (c) {1,2,5,9}   (d) None of these

(3) $\lim_{x \to \infty} \left(\frac{2x+1}{x} \right) = $ ....
   (a) 2   (b) 0   (c) ∞   (d) None of these

(4) $\frac{d^2}{dx^2} \left(x^{\frac{3}{2}} \right) = $ ....
   (a) $\frac{2}{3} x^{1/2}$ (b) $\frac{3}{2} x^{1/2}$ (c) $\frac{2}{3} x^{-1/2}$ (d) $\frac{3}{4} x^{-1/2}$

(5) $\int \frac{1}{\sqrt{t}} dt = $ ....
   (a) $2\sqrt{t} + c$ (b) $\frac{2}{t} + c$ (c) $\frac{2}{t^{1/2}} + c$ (d) none of these

(6) $\int 2 \, dx = $ ....
   (a) $x + c$ (b) $2x + c$ (c) $2x$ (d) 0

(7) The multiplication of 3 X 3 and 3 X 1 matrix is .... matrix.
   (a) 3 X 1   (b) 1 X 3 (c) 1 X 1   (d) 3 X 3

(8) When you multiply a matrix by the identity matrix, you obtain the.............
   (a) inverse matrix   (b) transpose of a matrix
   (c) original matrix   (d) adjoint matrix

Q.2.   Attempt any Seven of the following: [14]
   (1) Define function. State the application of function in Bioscience.

   (2) Find the equation of the straight line passing through the two points (1, -2)
       and (5, 6).

   (3) Find domain and range of the function $f(x) = \frac{2x+1}{x-9}$

   (4) Calculate the increment of the function $g(x) = 2x + 7, x = 3 \ and \ \Delta x = 0.2$.

   (5) Evaluate $\lim_{x \to 3}(x^2 + 2x)$.

   (6) Evaluate $\int \cos(3x + 2) \, dx$.

(1)

(7) Find the solution of differential equation $(dy/dt) = \ln t$.

(8) Define Transpose of a matrix and Square matrix by giving one example.

(9) If H=$\begin{bmatrix} 1 & 1 \\ 3 & 4 \end{bmatrix}$ and I=$\begin{bmatrix} 4 & 5 \\ 2 & 1 \end{bmatrix}$ the find the matrix HI.

Q.3   (A) If $f(x) = 2x^2 - 3x + 2$ then find $f(h)$, $f(1 + h)$, $f(x + h) - f(x)$.   [06]

     (B) (i) Find vertex of parabola of a function $y = - 2x^2 + x + 1$ [03]
         (ii) Find the value of $\log_{1/3} 243$.   [03]

<div align="center">OR</div>

     (B) Prove that $(1 + \cot\theta - \text{cosec}\theta)(1 + \tan\theta + \sec\theta) = 2$.   [06]

Q.4   (A) Given $f(t) = (2\sqrt{t} + 1)(t^2 + 3)$, find $f'(t)$.   [06]
     (B) If $f(t) = (x^2 + 1)/(x^3 + 4)$, find dy/dt.   [06]

<div align="center">OR</div>

     (B) Evaluate $\lim_{x \to \infty} \dfrac{2x^3 - 3x + 7}{5x^2 + x - 1}$.   [06]

Q.5   (A) Evaluate $\int (2x + 1)\sqrt{x^2 + x + 1}\ dx$ [06]

     (B) Find $\int \dfrac{x}{\sqrt{x^2 - 9}} dx$.   [06]

<div align="center">OR</div>

     (B) Find all second order partial derivative of a function $z = \sqrt{x^2 + y^2}$ [06]

Q.6

     (A) If A=$\begin{bmatrix} 1 & 0 & -2 \\ 3 & -1 & 0 \\ -2 & 1 & 1 \end{bmatrix}$, B=$\begin{bmatrix} 0 & 5 & -4 \\ -2 & 1 & 3 \\ -1 & 0 & 2 \end{bmatrix}$ and C=$\begin{bmatrix} 1 & 5 & 2 \\ -1 & 1 & 0 \\ 0 & -1 & 1 \end{bmatrix}$, then prove   [06]
         that A (B-C) = AB - AC.

     (B) If A=$\begin{bmatrix} 2 & -1 & 5 \\ 3 & 2 & -4 \\ -6 & 3 & 8 \end{bmatrix}$ obtain A+ A^T and A- A^T. What you can say about the   [06]
         A+ A^T and A- A^T matrices

<div align="center">OR</div>

     (B) Find the eigen values and the corresponding eigen vectors of the   [06]
         matrix $\begin{bmatrix} 5 & 2 & 2 \\ 3 & 6 & 3 \\ 6 & 6 & 9 \end{bmatrix}$.

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<div align="center">②</div>