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($\frac{A}{31}$) Sardar Patel University
M. Sc. Integrated Biotechnology (IGBT) – 1st Semester
Theory examination, April, 2016
Monday, 11th April, 2016; Time: 02:30 p.m. to 5:30 p.m.
Subject: PS01CIGB06: Biomathematics

Total Marks: 70

- Notes: - 1) Figures to the right indicate marks.
 2) Draw neat and labeled diagram, wherever necessary.

Q.1 Choose the Correct Answers of the Following. [08]

1. How many rational and irrational numbers are possible in between 0 and 1?
 (a) infinite (b) 0 (c) 1 (d) finite
2. The function $f(z) = 6z + 13$ represents
 (a) Straight line (b) Circle
 (c) Parabola opening upward (d) Parabola opening downwards
3. $\frac{d}{dx} (\sin^2 x) = \dots\dots\dots$
 (a) $\sin 2x$ (b) $2\sin x$ (c) $2\sin x \cos x$ (d) $2\cos x$
4. $\frac{d^2}{dx^2} (x^{\frac{3}{2}}) = \dots\dots\dots$
 (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. $\int 5 dx = \dots\dots\dots$
 (a) $x + c$ (b) $5x + c$ (c) $5x$ (d) 0
6. Integration of e^x with respect to x is _____.
 (a) 1 (b) e^x (c) 0 (d) None of these
7. The order of the inverse of any 3×3 matrix, if it exists it will be
 (a) 2×2 (b) 3×2 (c) 2×3 (d) 3×3
8. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then A is
 (a) Identity matrix (b) Diagonal matrix (c) Scalar matrix (d) All of these

Q.2 Answer the following in short. (Attempt Any Seven) [14]

1. If $A = \{-2, -1, 0, 1, 2, 3\}$ and $B = \{2, 3, 4, 5, 6\}$ find the intersection of set A and set B.
2. Evaluate the domain and range of the function $f(y) = \frac{y-2}{6y}$
3. Find coordinates of vertex of the parabola $f(y) = 3y^2 + 6y + 21$.
4. Evaluate $\lim_{x \rightarrow 2} (3x^2 + 7x - 1)$.
5. Determine the average rate of change of $f(y) = 3 - 7y$, $y = 2$ and $\Delta y = 0.5$.
6. Find $\int 2x^4 dx$.
7. Evaluate $\int 2 \sin x dx$.

8. Define: (a) Identity matrix (b) Diagonal matrix

9. Evaluate $A+B$ if it exists for $A = \begin{bmatrix} 1 & 4 \\ 4 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 1 \\ -2 & 1 \end{bmatrix}$

Q.3 (A) If $f(x) = 2x^2 - 3x + 7$, evaluate $f(3)$, $f(-2)$ and $\frac{f(c+h)-f(c)}{h}$. [06]

(B) Prove that, $\sin\theta(\operatorname{cosec}\theta + \sin\theta\sec^2\theta) = \sec^2\theta$. [06]

OR

(B) (i) Simplify: $\log(\log y^2) - \log(\log y)$. [03]

(ii) Find the slope and intercept of the given equation $2x + 4y = 13$. [03]

Q.4 (A) If $y = \frac{\sqrt{x+1}}{\sqrt{3x+4}}$ find dy/dx . [06]

(B) Evaluate: $\lim_{x \rightarrow \infty} \frac{8x^3 - 7x^2 + 5x - 1}{4x^3 - 7x^2 + 3x - 1}$. [06]

OR

(B) Find out local minimum and local maximum values, if they exist, for the function of single variable: $f(y) = 2y^3 + 4y^2 - 8y - 16$. [06]

Q.5 (A) Calculate the antiderivative of $\frac{3-5t+7t^2+t^3}{t^2}$. [06]

(B) (i) Evaluate: $\int \cos(2x+1) dx$ [03]

(ii) Find the integral of $\left[x - \frac{3}{x}\right]^2$ function. [03]

OR

(B) Calculate $\partial z/\partial x$, $\partial z/\partial y$ and $\partial^2 z/\partial y \partial x$ when $z = x^3 y^4$. [06]

Q.6 (A) If $A = \begin{bmatrix} 1 & 0 & -2 \\ 3 & -1 & 0 \\ -2 & 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 5 & -4 \\ -2 & 1 & 3 \\ -1 & 0 & 2 \end{bmatrix}$ evaluate AB if possible. [06]

(B) If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} -3 & 2 \\ 1 & 1 \end{bmatrix}$ evaluate the determinant of the given matrix. [06]

OR

(B) Find the eigenvalues and the corresponding eigenvectors of the matrix $\begin{bmatrix} 6 & 10 \\ -4 & -8 \end{bmatrix}$. [06]
