Roll No. ..................

**91037**

# B. Sc. (Hons) Chemistry Ist Sem.
## Examination – December, 2015

### MATHEMATICS – I OPTIONAL

*Time : Three Hours* ]    [ *Maximum Marks : 40*

*Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.*

**Note :** Attempt *one* question from each Section and Question No. 9 is *compulsory*. Each question carries equal marks.

### SECTION – I

1. (a) Prove that $A - (B \cup C) = (A - B) \cap (A - C)$.    4

   (b) Simplify $(a + \sqrt{b})^8 + (a - \sqrt{b})^8$ and find its value for $a = 1, b = 16$.    4

91037-450 -(P-4)(Q-9)(15)    **P. T. O.**

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(b) Find the area of the region enclosed by two circles    4
$$x^2 + y^2 = 1 \text{ and } (x-1)^2 + y^2 = 1$$

### SECTION – V

9. (a) If $A = \{a, b, c, d\}$ and $B = \{a, e\}$, then find $A \times B$.    1

   (b) Define the relation and function from the set A to B.    2

   (c) Find $\frac{dy}{dx}$ when $y = x \cdot \sin^{-1} x$    1

   ### SECTION – IV

   (d) Evaluate $\int \sin^{-1} x \, dx$    2

   (e) Find the value of $\sin 18° + \cos 72°$    1

   (f) Evaluate $\int\limits_{0}^{\pi/2} \frac{dx}{1 + \cos x}$.    1

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2. (a) Solve the equation

$4x^3 + 16x^2 - 9x - 36 = 0$, the sum of two of its roots being zero. 4

(b) How many words can be formed with the letters of the word 'PATALIPUTRA'? 4

**SECTION – II**

3. (a) Prove that $\sin^2 24° - \sin^2 6° = \dfrac{1}{2\sqrt{5}+2}$. 4

(b) Solve the equation $\cos 3x = \sin 2x$. 4

4. (a) Show that the given Function is not continuous at $x = 0$

$$f(x) = \begin{cases} \dfrac{e^{1/x}-1}{e^{1/x}+1}, & \text{when } x \neq 0 \\ 0, & \text{when } x = 0 \end{cases}$$ 4

(b) If $f(x) = \dfrac{x - |x|}{x}$, then find its limiting value, when $x \to 0$. 4

**SECTION – III**

5. (a) If $x\sqrt{1+y} + y\sqrt{1+x} = 0,\ x \neq y$, then prove that

$\dfrac{dy}{dx} = -\dfrac{1}{(1+x)^2}$. 4

(b) Find $\dfrac{dy}{dx}$ if $y = x^x + x^{1/x}$. 4

6. (a) Find the maximum and minimum value, if any, of the function

$f(x) = \sin 2x - x,\ 0 \leq x \leq 2\pi$ 4

(b) Prove that the area of rectangle of given perimeter is maximum when it is a square. 4

**SECTION – IV**

7. (a) Evaluate $\displaystyle\int \dfrac{1}{\sin x + \cos x}\, dx$. 4

(b) Evaluate $I = \displaystyle\int_0^{\pi/2} x^2 . \sin 3x\, dx$. 4

8. (a) Find the area bounded by the curve $y^2 = 4x$ and the line $x = 3$. 4