

(b) Evaluate :

4

No. of Printed Pages : 04

Roll No. ....

$$\int \tan^{-1} \left[ \frac{\sin 2x}{1 + \cos 2x} \right] dx$$

### Unit III

7. (a) Let  $W = e^{(5x + 6y)} \sin(x^2 + y^2)$ . Compute the partial derivative of  $W$  w.r.t. both variables  $x, y$  at the point  $p_0(1 - 2)$ . 9  
(b) Find  $\frac{\partial y}{\partial x}$  if  $y = v^3 + 2v^2 + 5$ ,  $v = 3u + 1$  and  $u = 9x + 1$ . 5
8. (a) Find the equation of a line perpendicular to line  $x - 2y + 3 = 0$  and passing through the point  $(1, -2)$ . 8  
(b) Find the area of a triangle whose vertices are  $(4, 4), (3, -2), (-3, 1)$ . 6
9. Solve the following differential equation : 14

$$\frac{d^2y}{dx^2} - 4y = x \sinh x$$

**AA-294**

### M. Sc. EXAMINATION, Dec. 2017

(First Semester)

(Main & Re-appear)

CHEMISTRY

CH-507-B

Mathematics for Chemists

*Time : 3 Hours]*

[*Maximum Marks : 70*

---

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

---

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

## Unit I

1. (a) If  $\vec{a} = t\hat{i} - 3\hat{j} + 2t\hat{k}$ ,  $\vec{b} = \hat{i} - 2\hat{j} + 2\hat{k}$ ,

$$\vec{c} = 3\hat{i} + \hat{j} - \hat{k} \text{ then find } \int_1^2 \vec{a} \cdot (\vec{b} \times \vec{c}) dt. \quad 6$$

(b)  $x = e^{-t}$ ,  $y = 2 \cos 3t$ ,  $z = \sin 3t$ , determine velocity and acceleration at  $t = 0$ . 8

2. (a) Without expanding the determinants show that : 9

$$\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3$$

(b) Using Binomial theorem expand  $(2-a)^5$ . 5

## Unit II

3. (a) If  $A = \begin{bmatrix} 4 & 3 & 7 \\ 6 & 5 & -8 \\ 1 & 2 & 6 \end{bmatrix}$ , express A as the sum of a symmetric and skew symmetric matrix. 7

(b) Find the inverse of the matrix : 7

$$A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$$

4. (a) Differentiate w.r.t.  $x$  : 7

$$y = \log\left(\left(\sqrt{a+x} + \sqrt{a-x}\right)/\left(\sqrt{a+x} - \sqrt{a-x}\right)\right)$$

(b) If  $e^x(x+1) = 1$ , show that : 7

$$\frac{d^2y}{dx^2} = \left(\frac{dy}{dx}\right)^2$$

5. Evaluate the following : 7+7

$$(a) \int \frac{(a^x - b^x)^2}{a^x b^x} dx$$

$$(b) \int (x^a + a^x + e^x \cdot a^x) dx$$

6. (a) If  $y = \sqrt{x}^{\sqrt{x}^{\sqrt{x}^{\sqrt{x}^{\dots}}}}$  prove that :

$$x \frac{dy}{dx} = \frac{y^2}{2 - y \log x} \quad 10$$