Roll No. .....

91537

B. Sc. (Hons.) Chemistry 2nd Sem.
Latest Examination – April, 2018

MATHEMATICS-II (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 ***five*** questions in all, selecting ***one*** question from each Section. Question No. 9 of Section-V is ***compulsory***. All questions carry equal marks.

SECTION – I

1. (a) Calculate the inverse of $A=\begin{bmatrix}1 & 3 & 2\\ 0 & 4 & 1\\ 5 & 2 & 3\end{bmatrix}$ by elementary row operations.

(b) Prove that $\begin{vmatrix}1 & a & a^2\\ 1 & b & b^2\\ 1 & c & c^2\end{vmatrix}=(b-c)(c-a)(a-b)$.

2. (a) Find the Eigen values and Eigen vectors of matrix $A=\begin{bmatrix}8 & -6 & 2\\ -6 & 7 & -4\\ 2 & -4 & 3\end{bmatrix}$.

(b) Solve the system $4x+3y+2z=-7$, $2x+y-4z=-1$, $x+2y+z=1$.

SECTION – II

3. (a) Prove that $(G, .)$ is group, where $G=\{1,-1,i,-i\}$.

(b) Prove that intersection of two subgroups of a group is subgroup of that group.

4. (a) If H is finite the number of elements in a right coset of H is equal to order of H.

(b) If N and H are normal subgroup of G, then prove that NH is normal subgroup of G.

SECTION – III

5. (a) Prove that the points (–2, –1), (1, 0), (4, 3) and (1, 2) are vertices of a parallelogram.

(b) Find the equation to the straight line, which passes through the point (4, –5) and which is parallel to the straight line $3x + 4y + 5 = 0$.

6. (a) Find the equation of parabola with focus (3, –4) and directrix $6x - 7y + 5 = 0$.

(b) Find the equation to the hyperbola, referred to its axis as axes of co-ordinates whose confugate axis is 7 and which passes through the point (3, –2).

SECTION – IV

7. (a) Find the directional derivative of the function $\phi = x^2 - y^2 + 2z^2$ at the point $P(1, 2, 3)$ in the direction of the line PQ where Q is the point (5, 0, 4).

(b) Prove that $\vec{a}.\nabla\left(\frac{1}{r}\right) = -\frac{\vec{a}.\vec{r}}{r^3}$ where a is constant vector and $r = |\vec{r}|$.

8. (a) Prove that $\nabla \times (\nabla \times \vec{f}) = \nabla(\nabla.\vec{f}) - \nabla^2 \vec{f}$.

(b) If $\vec{a} = 2i - 10j + 2k$, $b = 3i + j + 2k$, $c = 2i + j + 3k$ then find :

(i) $\vec{a} \times (\vec{b} \times \vec{c})$ (ii) $(\vec{a} \times \vec{b}).\vec{c}$

(iii) $(\vec{a} \times \vec{b}) \times \vec{c}$ (iv) $(\vec{a} \times \vec{b}) \times (\vec{a} \times \vec{b})$

SECTION – V

9. (a) Define a Quotient group with example.

(b) Find rank of matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -2 & 0 \end{bmatrix}$.

(c) If $\phi = 3x^2y - y^3z^2$, find $\nabla\phi$ at (1, 1, 1).

(d) Define left coset with example.

(e) Find the equation to the straight line cutting off intercepts 3 and 2 from the axes.

(f) Define rank of a Matrix.