



- **8.** (a) If $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, show that grad $\left(\frac{1}{r}\right) = -\frac{r}{r^3}$ where $|\vec{r}| = r$.
 - (b) Prove that:

$$(y^2 - z^2 + 3yz - 2x)\hat{i} + (3xz + 2xy)\hat{j} + (3xy - 2xz + 2z)\hat{k}$$
is both solenoidal and irrotational.

SECTION - V

- **9.** (a) What is the sum & product of eigen values of unit matrix.
 - (b) Define Curl of a vector with example.
 - (c) Find the value of |2A| if |A| = 3 where A is matrix of order 3×3 .
 - (d) Define Group with example.
 - (e) Find the equation of circle which touches the x-axis at the origin and whose radius is 5.
 - (f) Show that $\hat{i} \cdot (\hat{j} \times \hat{k}) = \hat{j} \cdot (\hat{k} \times \hat{i}) = \hat{k} \cdot (\hat{i} \times \hat{j}) = 1$.

Roll No.

91537

B. Sc. 2nd Sem. (Chemistry)Hons. (New Scheme) Examination – May, 2016

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 9 of Section-V is compulsory. All questions carry equal marks.

SECTION-I

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

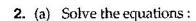
and verify that $A.A^{-1} = A^{-1}.A = I$.

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(b) Prove that:

$$\begin{vmatrix} 1 & x & x^3 \\ 1 & y & y^3 \\ 1 & z & z^3 \end{vmatrix} = (x-y)(y-z)(z-x)(x+y+z)$$



$$2x + 3y + z = 9$$
, $4x + y = 7$, $x - 3y - 7z = 6$ using Cramer's Rule.

(b) Find eigen values and the corresponding eigen

vectors of
$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$

SECTION - II

- **3.** (a) If $a^2 = e$ for all $a \in G$. Where G is a Group; then prove that G is abelian.
 - (b) If H_1 and H_2 are two subgroups of G, then $H_1 \cap H_2$ is also a subgroup.
- (a) If H is a subgroup of G, then G is equal to the union of all right cosets of H in G.

(b) Let H be a subgroup of G and N be a normal subgroup of G. Then $H \cap N$ is a normal subgroup of H.

SECTION - III

- **5.** (a) Find the equation of the median bisecting BC where A(4, 10), B(9, -4) and C(-1, -2) are the vertices of a triangle.
 - (b) Find the equation of the line that is parallel to 2x + 5y 7 = 0 and passes through the midpoint of the segment joining (2,7) and (-4,1).
- **6.** (a) Find the equation σ_+ the circle passing through the points (1, 1) and (2, 2) and whose radius is 1.
 - (b) Find the equation of the parabola whose focus is (0,-1) and the directrix is x + y 1 = 0.

SECTION - IV

7. (a) If \vec{a} and \vec{b} are two vectors such that $|\vec{a}| = 2$, $|\vec{b}| = 7$ and $\vec{a} \times \vec{b} = 3\hat{i} + 2\hat{j} + 6\hat{k}$, find the angle between \vec{a} and \vec{b} .

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P.T.O.