

- (b) A particle moves on the curve $x = 2t^2, y = t^2 - 4t, z = 3t - 5$, where t is time. Find the components of velocity and acceleration at time $t = 1$ in the direction $\hat{i} - 3\hat{j} + 2\hat{k}$.

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

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 $\hat{i} \cdot (\hat{j} \times \hat{k}) = \hat{j} \cdot (\hat{k} \times \hat{i}) = \hat{k} \cdot (\hat{i} \times \hat{j}) = 1$.

91537- (P-4)(Q-9)(16) (4)

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 $A \cdot A^{-1} = A^{-1} \cdot A = I$.

91537-34Q(P-4)(Q-9)(16)

P. T. O.

(b) Prove that :

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

2. (a) Solve the equations :

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

(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.

4. (a) If H is a subgroup of G , then G is equal to the union of all right cosets of H in G .

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(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_c 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} .

91537- (P-4)(Q-9)(16) (3)

P.T.O.