

(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) $(\vec{a} \times \vec{b}) \cdot \vec{c}$

(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.

Roll No.

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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.

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

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, \cdot) 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.

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-(P-4)(Q-9)(18) (2)

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

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

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-(P-4)(Q-9)(18) (3)

P. T. O.