

RAN-2503000504043001
S. Y. B. Sc. (Sem.-IV) Examination April - 2026
Minor Mathematics
Vector Calculus : Theory and Applications
Time: 1 Hours]
[Total Marks: 25

સૂચના : / Instructions (1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવર્ણી પર અવશ્ય લખવી. Fill up strictly the above details on your answer book (2) All questions are compulsory. (3) Figures to the right indicate marks of the corresponding question. (4) Follow usual notations and conversations.	Seat No.: Student's Signature
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Q:1 Answer the following. (Any five)

- 1 Define: Divergence of a vector point function..
- 2 If $(1, 3, -1)$ and $(-2, 1, 5)$ are two vectors then find their vector product.
- 3 Define: Laplacian operator.
- 4 If $\vec{r} = (t^2 + 2t - 1)\hat{i} + (t^2 + 3t)\hat{j} + (t^3 - t^2 + 1)\hat{k}$, then find $\frac{d\vec{r}}{dt}$.
- 5 Define: Unit Vector.
- 6 If $f = x^3y - y^3 + xyz^2$, then find the value of ∇f

Q:2 Answer the following. (Any Two)

- 1 Find a vector in the direction of vector $\vec{a} = \hat{i} - 2\hat{j}$ that has magnitude 7 units.
- 2 If $\vec{r} = t^2\hat{i} + \sin t\hat{j} + (1 - t)\hat{k}$, then find $\frac{d\vec{r}}{dt}$, $\frac{d^2\vec{r}}{dt^2}$, $\left|\frac{d^2\vec{r}}{dt^2}\right|$ at $t=0$.
- 3 If $\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{c} = 3\hat{i} - \hat{j} + 2\hat{k}$ then find $(\vec{a} \times \vec{b}) \times \vec{c}$.

Q:3 Answer the following. (Any Two)

- 1 If $\vec{f} = (xy^2)\hat{i} + (2x^2y)\hat{j} - (3yz^2)\hat{k}$, then find $\text{div } \vec{f}$ and $\text{Curl } \vec{f}$ at $(1, -1, 1)$.
- 2 Find the directional derivative of $f(x, y, z) = xyz + z^2$ at the point $(1, 1, 1)$ in the direction of point $(2, 3, 3)$.
- 3 Define divergence of a vector function. If $\vec{U}$ and $\vec{V}$ are differentiable vector functions, then prove that $\text{div} \left(\vec{U} + \vec{V} \right) = \text{div } \vec{U} + \text{div } \vec{V}$