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Electromagnetics
Course # EC341
Term: 6th

Sheet (1)

1. Find the vector \vec{A} directed from $(2, -4, 1)$ to $(0, -2, 0)$ in Cartesian coordinates and find the unit vector along \vec{A} .
2. If $\vec{A} = 3\hat{a}_x + 4\hat{a}_y$ and $\vec{B} = 2\hat{a}_x - 5\hat{a}_y$, find both algebraically and graphically: $\vec{A} + 2\vec{B}$, $\vec{A} - \vec{B}$, $(\vec{A} + \vec{B})/2$.
3. Find the distance between $(5, \frac{3\pi}{2}, 0)$ and $(5, \frac{\pi}{2}, 10)$ in cylindrical coordinates.
4. Show that $\vec{A} = 4\hat{a}_x - 2\hat{a}_y - \hat{a}_z$ and $\vec{B} = \hat{a}_x + 4\hat{a}_y - 4\hat{a}_z$ are perpendicular.
5. Given that $\vec{A} = 2\hat{a}_x + 3\hat{a}_y + \hat{a}_z$, $\vec{B} = \hat{a}_x + 2\hat{a}_y + 3\hat{a}_z$, find
 - (i) $\vec{A} \cdot \vec{B}$,
 - (ii) $\vec{A} \times \vec{B}$,
 - (iii) \hat{a}_A , \hat{a}_B and the unit vector of $\vec{A} \times \vec{B}$
6. Given that $\vec{A} = 4\hat{a}_x - 3\hat{a}_z$ and $\vec{B} = 2\hat{a}_x - 2\hat{a}_y + \hat{a}_z$, find :
 - (i) Unit vector \hat{a}_A and \hat{a}_B
 - (ii) The projection of \vec{A} on \vec{B}
 - (iii) The angle between \vec{A} and \vec{B}
7. Given $\vec{A} = \hat{a}_x + \hat{a}_y$, $\vec{B} = \hat{a}_x + 2\hat{a}_z$, $\vec{C} = 2\hat{a}_y + \hat{a}_z$, Find $\vec{A} \cdot (\vec{B} \times \vec{C})$ and compare it with $(\vec{A} \times \vec{B}) \cdot \vec{C}$
8. For a right circular cone of vertex angle 60° , and height $5\sqrt{3}$ cm. Determine the total surface area of the cone.
9. Use the spherical coordinate system to find the area of strip $\alpha \leq \theta \leq \beta$ on the spherical shell of radius (r) (**Fig. 1**). what results when $\alpha = 0$ and $\beta = \pi$?

10. A right circular cylinder of radius 3 cm and height 10 cm, filled with water. If a solid sphere of radius 3 cm is inserted inside the cylinder, find:
- The volume of the water in the cylinder.
 - The surface area of the sphere and of the cylinder.
11. Use the cylindrical coordinate system to find the area of the curved surface of right circular cylinder where $r = 2\text{m}$, $h = 5\text{m}$, and $30^\circ \leq \varphi \leq 120^\circ$ (**Fig. 2**)

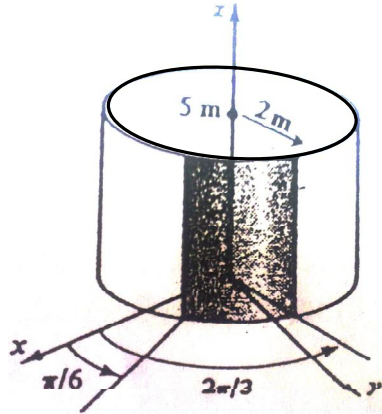


Fig. 2

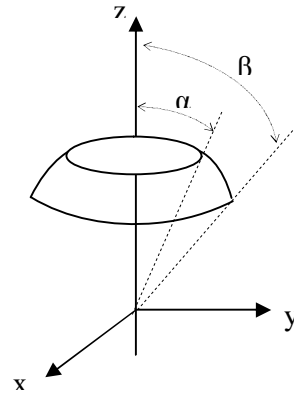


Fig. 1