

KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS

Department of Electrical Engineering

EE 340 Electromagnetic

Homework 1 (Due Sat. Sep. 22)

1- Let $\vec{E} = 3\hat{a}_y + 4\hat{a}_z$ and $\vec{F} = 4\hat{a}_x - 10\hat{a}_y + 5\hat{a}_z$.

(a) Find the component of $\vec{E}$ along $\vec{F}$.

(b) Determine a unit vector perpendicular to both $\vec{E}$ and $\vec{F}$.

2-

(a) Convert points $P(1,3,5)$, $T(0,-4,3)$, $S(-3,-4,-10)$ from Cartesian to cylindrical and spherical coordinates.

(b) Transform vector

$$\vec{Q} = \frac{\sqrt{x^2 + y^2}}{\sqrt{x^2 + y^2 + z^2}} \hat{a}_x - \frac{yz}{\sqrt{x^2 + y^2 + z^2}} \hat{a}_z$$

to cylindrical and spherical coordinates.

(C) Evaluate $\vec{Q}$ at T in the three coordinate systems.

3- For the vector $\vec{F} = x^3\hat{a}_x + x^2y\hat{a}_y + x^2z\hat{a}_z$, determine the integral $\oint_s \vec{F} \cdot d\vec{s}$ over a cylindrical surface of radius 4 and bounded by planes $z = 0$ and $z = 4$.