King Fahd University of Petroleum and Minerals
MATH-302
Quiz 3

Name:- **ID:-** **Sec.:04**

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(1) Express vector $\mathbf{G} = 6r^2 \sin\theta \cos\varphi\, \boldsymbol{a_r} + 4r \cos\theta \sin\varphi\, \boldsymbol{a_\theta} + r^3 \boldsymbol{a_\varphi}$ in cartesian coordinates.

Hint.

$$\begin{pmatrix} A_r \\ A_\theta \\ A_\varphi \end{pmatrix} = \begin{pmatrix} \sin\theta\cos\varphi & \sin\theta\sin\varphi & \cos\theta \\ \cos\theta\cos\varphi & \cos\theta\sin\varphi & -\sin\theta \\ -\sin\varphi & \cos\varphi & 0 \end{pmatrix} \begin{pmatrix} A_x \\ A_y \\ A_z \end{pmatrix}$$

(2) If $\boldsymbol{E} = 6r^2 \sin\theta \cos\varphi\, \hat{\boldsymbol{a}}_{\boldsymbol{r}} + 4r \cos 2\theta \sin(\varphi/2)\, \hat{\boldsymbol{a}}_{\boldsymbol{\theta}} + r^{\boldsymbol{3}} \hat{\boldsymbol{a}}_{\boldsymbol{\varphi}}$ at $A(2, \frac{\pi}{6}, \frac{\pi}{3})$ determine the vector component of $\boldsymbol{E}$ that is:

(a) Tangential to the spherical surface $r = 2$.

(b) Normal to the surface $\varphi = \pi/3$.