Roll No:							

PADRE CONCEIÇÃO COLLEGE OF ENGINEERING,
VERNA-GOA

TUTORIAL NO: 10

Semester: II (RC 2019-'20)
Course Instructor: Ms. Komal Paroolkar

Course: FE210
Mathematics-II

Topic: Gradient, Divergence, Curl.

		CO	CL
Q1.	Find the directional derivative of $f(x,y,z) = x^2y + 2yz$ in the direction of $\hat{\imath} - \hat{\jmath} + \hat{k}$ at the point $(1,-1,0)$	**FE210.3**	**CL3**
Q2	Define curl of a vector field. Find the curl of $\varphi(x,y,z) = 2xy\,\hat{\imath} + z\,\hat{\jmath} + y^2\hat{k}$	**FE210.3**	**CL3**
Q3	Find the directional derivative of $f(x,y,z) = y^2x + xz^3$ in the direction of $\hat{\imath} + 2\hat{\jmath} + 2\hat{k}$ at the point $(2,-1,1)$	**FE210.3**	**CL3**
Q4.	Find the unit normal to the surface $x^2 + y^2 + z^2 = 25$ at $(4,3,0)$	**FE210.3**	**CL3**
Q5.	In what direction from the point $(2,1,-1)$ is the directional derivative of $\varphi = x^2yz^3$ a maximum? What is it's magnitude?	**FE210.3**	**CL3**

CO	CL

Q6. Find the value of $p\ if\ \bar{F} = (x + 3y)\hat{\imath} + (y - 2z)\hat{\jmath} + (pz + x)\hat{k}$ is solenoidal. **FE210.3 CL3**

Q7. If $\bar{r} = \sqrt{x^2 + y^2 + z^2}\ and\ \bar{r} = x\hat{\imath} + y\hat{\jmath} + x\hat{k}$ then show that $Curl\ (r^n\bar{r}) = \bar{0}$ **FE210.3 CL3**

Q8. If $\bar{r} = x\hat{\imath} + y\hat{\jmath} + x\hat{k}\ and\ \bar{a}$ is a constant vector then show that **FE210.3 CL3**

(i) $div\ (\bar{a} \times \bar{r}) = 0$

(ii) $curl\ (\bar{a} \times \bar{r}) = 2\bar{a}$

Q9. Show that the vector field $\bar{F} = (6xy^2 - 2z^3)\hat{\imath} + (6x^2y + 2yz)\hat{\jmath} + (y^2 - 6z^2x)\hat{k}$ is irrotational and find it's potential function. **FE210.3 CL3**

Q10. In what direction is the directional derivative of $\varphi = x^2y^2z^4\ at\ (3, -1, -2)$ maximum? What is it's magnitude? **FE210.3 CL3**

Q11. Show that the vector field $\bar{F} = (y^2 - 2xyz^3)\hat{\imath} + (3 + 2xy - x^2z^3)\hat{\jmath} + (6z^3 - 3x^2yz^2)\hat{k}$ is irrotational and find it's scalar potential. **FE210.3 CL3**