ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE – 27
MID-SEMESTER TEST – AUGUST 2016
M.Sc. MATHEMATICS – III SEMESTER
MT 9314 :FLUID MECHANICS

Time: 1 ½ hours **Max Marks : 35**

ANSWER ANY FIVE OF THE FOLLOWING $7 \times 5 = 35$

1. a. Describe the range convention and summation convention with example.
   b. State and prove the first quotient law. (4+3M)
2. Describe the Levi – Civita ε - Symbol. Prove that $\delta_{ij}\delta_{jk}a_{km} = a_{im}$. (5+2M)
3. State and Prove ε - δ relation. Hence prove that $\varepsilon_{ijk}\varepsilon_{ijk} = 6$. (5+2M)
4. Show that $\nabla^2(r^2) = 6$, where $r^2 = x_i x_i$. (7M)
5. a. If A is a tensor such that A.B = 0 for every tensor B, Show that A is the zero tensor.
   b. Show that $(a \otimes b)\cdot(c \otimes d) = (a.c)(b.d)$. (4+3M)
6. Prove the following:
   c. $div(curl A) = curl(div\, A^T)$
   d. $div(curl\, A)^T = 0$. (4+3M)
7. State and Prove the Divergence theorem for tensors. (7M)