

NAVRACHANA UNIVERSITY
SLSE-B.Sc PROGRAMME
END SEMESTER EXAMINATION NOV-17
T.Y B.Sc Semester – 5

Subject: DYNAMICS

Course Code: MA304

Date: 24/11/17

Total Marks = 40

Time: 1.00PM TO 3.00PM

Instructions:

- Write each answer on a new page.
- Use of calculator is permitted

Q1: Do as directed. (All are compulsory)

-----(20 M)

- 1) Evaluate $\text{grad } \phi$ if $\phi = \log(x^2 + y^2 + z^2)$
- 2) If $u = x^2 + y^2 + z^2$ and $r = xi + yj + zk$, then find $\text{div}(ur)$ in terms of u .
- 3) For any vector field show that $\text{div}(\text{curl } V) = 0$.
- 4) Evaluate $\text{curl } F$ if $F = \text{grad}(x^3 + y^3 + z^3 - 3xyz)$.

Q2: Do as directed. (All are compulsory)

-----(20 M)

- 1) If $V(x, y, z)$ is a differentiable vector function and $\phi(x, y, z)$ is a scalar function
Then derive the expression of $\text{div}(\phi V)$ in terms of $\phi, V, \text{div}V, \nabla\phi$.
- 2) The temperature at any point in space is given by $T = xy + yz + zx$. Determine the derivative of T in the direction of the vector $3i - 4k$ at the point $(1, 1, 1)$.
- 3) Prove that $\text{curl}(\phi F) = (\text{grad } \phi) \times (F)$, if F is irrotational and $\phi(x, y, z)$ is a scalar function.
- 4) If $V = \frac{xi + yj + zk}{\sqrt{x^2 + y^2 + z^2}}$ then prove that V is irrotational.