

Sub:- Mathematics (Paper 13)

Assignment Full Marks 20 (Answer any two questions)

1. Find the equation of continuity in cartesian form.
2. Derive Euler's dynamical equations of motion for non-viscous fluids in cartesian form.
3. Prove that the general motion of a fluid particle consists of a translation, a rotation and a deformation.

Sub:- Mathematics (Paper 14)

Assignment Full Marks 20 (Answer any two questions)

1. Explain, in details, the nature and characteristic of operation research.
2. Define the dual of an LPP and prove that if the primal has an unbounded solution, dual has no solution and vice versa.
3. Write short notes on the following:
 - (i) Direct root method
 - (ii) Random search method.

Sub:- Mathematics (Paper 15)

Assignment Full Marks 20 (Answer any two questions)

1. (a) What do you mean by dynamical system? Explain how it is represented by a system of differential equation.
(b) Discuss the stability of the system in which the perturbed equation of motion is given by

$$\frac{dx}{dt} = ay \text{ and } \frac{dy}{dt} = ax$$

where a is some real constant.

2. Investigate the nature of the elementary singular points for the linear system

$$\dot{x} = ax + by; \quad \dot{y} = cx + dy$$

where $\begin{vmatrix} a & b \\ c & d \end{vmatrix} \neq 0$.

3. Prove that the trivial solution of the non linear

$$\{\dot{x}\} = [A]\{x\} + \{X\}$$

is asymptotically stable irrespective of the non-linear part $\{X\}$ if and only if all the eigenvalue of $[A]$ have negative real parts.