



## Module – 3

Q.5	a.	Obtain the Euler's equation of motion along a stream line. Obtain Bernoulli's equation. Mention the assumption made.	08	L3	CO3
	b.	Derive an expression for discharge through a rectangular notch.	06	L3	CO3
	c.	An oil of specific gravity 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm. The oil-mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through the horizontal venturimeter. Take $C_d = 0.98$ .	06	L3	CO3

## OR

Q.6	a.	Derive Darcy-Weisbach equation for loss of head due to friction in pipe.	08	L3	CO3
	b.	Derive an expression for the loss of head due to the sudden enlargement in pipe.	06	L3	CO3
	c.	What are the energy losses that occur in pipe? Give the expressions for different minor energy losses.	06	L2	CO3

## Module – 4

Q.7	a.	Define the drag force and lift force. Also derive their expressions.	10	L3	CO4
	b.	Briefly explain what is meant by boundary layer and hence define the following: (i) Boundary layer thickness (ii) Displacement thickness	06	L2	CO4
	c.	Explain what is stream-lined body and bluff body.	04	L2	CO4

## OR

Q.8	a.	What is dimensional homogeneity? Explain with examples.	04	L2	CO4
	b.	What is similitude? Explain the following : (i) Geometric similarity (ii) Dynamic similarity (iii) Kinematic similarity	08	L2	CO4
	c.	Show by Buckingham's $\pi$ theorem that the frictional torque 'T' of a disc of diameter 'D' rotating at speed N in a fluid of viscosity ' $\mu$ ' and density ' $\rho$ ' in a flow is given by $T = D^5 N^2 \rho \phi \left[ \frac{\mu}{D^2 N \rho} \right]$	08	L3	CO4

## Module – 5

Q.9	a.	Show that velocity of propagation of elastic wave in an adiabatic medium is given by $C = \sqrt{KRT}$ starting from fundamentals.	10	L3	CO5
	b.	An air plane is flying at an altitude of 15 km where the temperature is $-50^\circ\text{C}$ . The speed of the plane corresponds to Mach number of 1.6. Assume $K = 1.4$ and $R = 287 \text{ J/kgK}$ for air, find the plane speed and Mach angle.	10	L3	CO5

## OR

Q.10	a.	Define the following terms: (i) Subsonic flow      (ii) Sonic flow      (iii) Supersonic flow (iv) Mach number      (v) Mach angle	10	L2	CO5
	b.	Explain the necessity of CFD. Mention its advantages, limitations and its applications.	10	L2	CO5

\*\*\*\*\*