Hall Ticket No | | | | | | | | | | | Question Paper Code: AAEB03

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER - II

B.Tech III Semester End Examinations, November – 2019

Regulations: IARE - R18

FLUID DYNAMICS

(AERONAUTICAL ENGINEERING)

Time: 3 hours **Max. Marks: 70**

Answer ONE Question from each MODULE
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1.	a)	List out the physical properties of fluids. Define them and write their units?	**[7M]**
	b)	The space between two parallel plates kept 3mm apart is filled with an oil of dynamic viscosity 0.2 Pa.s. What is the shear stress on the lower fixed plate, if the upper one is moved with a velocity of 1.50m/sec?	**[7M]**
2.	a)	Express pressure intensity of 7.5 kg/cm2 in all pressure units. Take the barometer reading as 76 cm of mercury.	**[7M]**
	b)	If 5 m^3 of certain oil weighs 4000 kg (f), calculate the specific weight, mass density, and specific gravity of oil.	**[7M]**

MODULE – II

3.	a)	Define and explain stream line, path line and streak line in fluid mechanics	**[7M]**
	b)	Define and distinguish between (i) steady and unsteady flow, (ii) uniform and non-uniform flow, (iii)rotational and irrotational flow	**[7M]**
4.	a)	Explain different types of flows in fluid mechanics.	**[7M]**
	b)	A bend in pipeline conveying water gradually reduces from 60 cm to 30 cm diameter and deflects the flow through angle of 600 At the larger end the gage pressure is 1.75 kg/cm2 Determine the magnitude and direction of the force exerted on the bend, i) when there is no flow, ii) when the flow is 876 litres per sec.	**[7M]**

MODULE – III

5. a) Derive the Darcy Weisbach equation **[7M]**
   b) A pipe of dia 400mm carries water at a velocity of 25m/s. The pressures at a point are given as 29.43n/cm2 and 22.563n/cm2 while the datum head at A and B are 28m and 30m. Calculate the loss of head between A and B **[7M]**

6. a) A venture meter having a diameter of 7.5 cm at the throat and 15 cm diameter at the enlarged end is installed in a horizontal pipeline 15 cm in diameter carrying an oil of specific gravity 0.9.The difference of pressure head between the enlarged end and the throat recorded by a U-tube is 17.5 cm of mercury. Determine the discharge through the pipe. Assume the co-efficient of discharge of the meter as 0.97. **[7M]**
   b) In a 100mm diameter horizontal pipe a Venturimeter of 0.5 contraction ratio has been fixed the head of water on the meter when there is no flow is 3m. Find the rate of flow for which the throat pressure will be 2m of water absolute. Take atmospheric pressure head= 10.3m of water. The coefficient of meter is 0.97 **[7M]**

MODULE – IV

7. a) A jet of water strikes with a velocity of 50 m/sec a flat fixed plate inclined at 30 degrees with the axis of the jet. The cross sectional area of the plate is 100 cm^2. Find the force exerted by the jet on the plate and the ratio in which the jet gets divided after striking. **[7M]**
   b) What are the elements of hydroelectric power stations? Explain them in detail. **[7M]**

8. a) A jet of water of diameter 50 mm moving with a velocity of 20 m/s strikes a fixed plate in such a way that the angle between the jet and the plate is 60°. Find the force exerted by the jet on the plate (i) in the direction normal to the plate, and (ii) in the direction of the jet. **[7M]**
   b) Explain briefly the principles on which a Kaplan turbine works. **[7M]**

MODULE – V

9. a) How will you classify the reciprocating pumps? **[7M]**
   b) Define slip, percentage slip and negative slip of reciprocating pump? **[7M]**

10. a) What do you mean by manometric efficiency, mechanical efficiency and overall efficiency of centrifugal pump. **[7M]**
    b) Draw and discuss the operating characteristics of a centrifugal pump. **[7M]**

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FLUID DYNAMICS

COURSE OBJECTIVES:

I	Illustrate about the basic properties of a fluid, hydrostatic forces on submerged bodies and different manometers.
II	Derive the basic principles of a fluid-continuity, momentum, Euler and Bernoulli's equations.
III	Explain the concept of boundary layer theory and importance of Prandtl's boundary layer theory.
IV	Understand the flow through pipes and their losses for different geometries.

COURSE OUTCOMES (COs):

CO 1	Understand the basic fluid properties and fluid dynamic concepts with its applications of fluid statics to determine forces of buoyancy and stability; and to fluids in rigid-body motion.
CO 2	Use of conservation laws in differential forms and Understand the dimensional methods and kinematics of fluid particles.
CO 3	Use Euler's and Bernoulli's equations and the conservation of mass to determine velocities, pressures, and accelerations for incompressible and inviscid fluids.
CO 4	Understand the concepts of viscous boundary layers, mechanics of viscous flow effects on immersed bodies and its forces.
CO 5	Apply principles of fluid mechanics to the operation, design, and selection of fluid machinery and to understand the ethical issues associated with decision making.

COURSE LEARNING OUTCOMES (CLOs):

AAEB03.01	Define the properties of fluids and its characteristics, which will be used in aerodynamics, gas dynamics, marine engineering etc.
AAEB03.02	Explain the hydrostatic forces on submerged bodies, variation with temperature and height with respect to different types of surfaces.
AAEB03.03	Define different types of manometers and explain buoyancy force, stability of floating bodies by determining its metacentre height.
AAEB03.04	Dimensional similarity and prediction of flow behaviour using dimensionless numbers.
AAEB03.05	Classification of fluid flows and governing equations of inviscid fluid flows.
AAEB03.06	Conceptual analysis of fluid flow and exact solutions of navier stokes equations for coquette flow and poiseuille flow.
AAEB03.07	Define Fluid forces and describe the motion of a fluid particle with fluid deformation;
AAEB03.08	Determine the Euler's and Bernoulli's equation and obtain its phenomenological basis of Naviers-stokes equation.
AAEB03.09	Describe about the flow measurements using different equipments of fluid flows.
AAEB03.10	Understand the Concept of boundary layer flows and control of flow separation.
AAEB03.11	Determine the flows over streamlined and bluff bodies to predict the drag and lift forces.
AAEB03.12	Understand the thickness factor with respect to Displacement, momentum and energy thickness.
AAEB03.13	Explain about the turbo machinery systems and working.
AAEB03.14	Describe the concepts of turbo machinery in the field of aerospace engineering and concepts of internal flows through engines.
AAEB03.15	Demonstrate the knowledge gained from the working of compressors, fans and pumps

MAPPING OF SEE – COURSE OUTCOMES

SEE Question No.		Course Learning Outcomes		Course Outcomes	Blooms' Taxonomy Level
1	a	AAEB03.01	Define the properties of fluids and its characteristics, which will be used in aerodynamics, gas dynamics, marine engineering etc.	CO1	Remember
	b	AAEB03.01	Define the properties of fluids and its characteristics, which will be used in aerodynamics, gas dynamics, marine engineering etc.	CO1	Remember
2	a	AAEB03.04	Classification of fluid flows and governing equations of inviscid fluid flows.	CO2	Remember
	b	AAEB03.02	Explain the hydrostatic forces on submerged bodies, variation with temperature and height with respect to different types of surfaces.	CO1	Understand
3	a	AAEB03.03	Define different types of manometers and explain buoyancy force, stability of floating bodies by determining its meta-centre height.	CO1	Remember
	b	AAEB03.03	Define different types of manometers and explain buoyancy force, stability of floating bodies by determining its meta-centre height.	CO1	Remember
4	a	AAEB03.05	Classification of fluid flows and governing equations of inviscid fluid flows.	CO2	Remember
	b	AAEB03.04	Dimensional similarity and prediction of flow behaviour using dimensionless numbers.	CO2	Remember
5	a	AAEB03.07	Define Fluid forces and describe the motion of a fluid particle with fluid deformation.	CO3	Understand
	b	AAEB03.07	Define Fluid forces and describe the motion of a fluid particle with fluid deformation.	CO3	Remember
6	a	AAEB03.08	Determine the Euler's and Bernoulli's equation and obtain its phenomenological basis of Naviers-stokes equation.	CO3	Understand
	b	AAEB03.08	Determine the Euler's and Bernoulli's equation and obtain its phenomenological basis of Naviers-stokes equation.	CO3	Understand
7	a	AAEB03.10	Understand the Concept of boundary layer flows and control of flow separation.	CO4	Understand
	b	AAEB03.11	Determine the flows over streamlined and bluff bodies to predict the drag and lift forces.	CO4	Remember
8	a	AAEB03.12	Understand the thickness factor with respect to Displacement, momentum and energy thickness.	CO4	Understand
	b	AAEB03.12	Understand the thickness factor with respect to Displacement, momentum and energy thickness.	CO4	Understand
9	a	AAEB03.13	Explain about the turbo machinery systems and working.	CO5	Remember
	b	AAEB03.13	Explain about the turbo machinery systems and working.	CO5	Understand
10	a	AAEB03.14	Describe the concepts of turbo machinery in the field of aerospace engineering and concepts of internal flows through engines.	CO5	Remember
	b	AAEB03.15	Demonstrate the knowledge gained from the working of compressors, fans and pumps.	CO5	Remember

Signature of Course Coordinator **HOD, AE**