Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem Examination May-2024

AU3CO47 / FT3CO34 / ME3CO46

Fluid Mechanics & Machinery

Programme: B.Tech. Branch/Specialisation: AU/FT/ME

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. Surface tension _____. **1**

(a) Acts in the plane of the interface normal to any line in the surface
(b) Is also known as capillarity
(c) Is a function of the curvature of the interface
(d) Decreases with fall in temperature

ii. Which of the following statements is correct about the shear stress distribution in circular pipes with laminar flow? **1**

(a) It is linear with maximum value at the centre
(b) It is parabolic with maximum value at the centre
(c) It is parabolic with zero value at the centre
(d) It is linear with zero value at the centre

iii. Which of the following equations is derived from Euler's equation of motion along a streamline? **1**

(a) Bernoulli's equation
(b) Continuity equation
(c) Linear momentum equation
(d) Moment of momentum equation

iv. Which of the following types of flow involves constant velocity magnitude and direction at any given point in the fluid? **1**

(a) Ideal flow
(b) Real flow
(c) Steady flow
(d) Unsteady flow

v. Pelton turbines are examples of which type of hydraulic turbines? **1**
(a) Impulse turbines
(b) Reaction turbines
(c) Mixed flow turbines
(d) Centrifugal turbines

vi. Which of the following efficiencies represents the ratio of the power delivered by the turbine to the power supplied to the turbine, taking into account losses due to hydraulic and mechanical factors? **1**
(a) Hydraulic efficiency
(b) Volumetric efficiency
(c) Mechanical efficiency
(d) Overall efficiency

vii. Which term is defined as the pressure head measured by a mercury or water manometer at the inlet or outlet of a pump? **1**
(a) Manometric head
(b) Gross head
(c) Static head
(d) Dynamic head

viii. What is the purpose of priming in centrifugal pumps? **1**
(a) To prevent cavitation
(b) To increase the pump efficiency
(c) To reduce the pump's power consumption
(d) To remove air from the pump suction line and casing

ix. Similitude is a concept applicable to the testing of _____. **1**
(a) Mathematical models
(b) Physical models
(c) Engineering models
(d) Chemical models

x. A model of with same shape is _____. **1**
(a) Geometric similarity
(b) Kinematic similarity
(c) Dynamic similarity
(d) Conditional similarity

Q.2 i. Define the followings: **2**
(a) Mass density
(b) Specific gravity

ii. Explain the term viscosity with diagram. **3**

iii. Derive the relation for newton's law of viscosity with diagram. **5**

OR iv. Derive the relation for hydrostatic force on an inclined surface. **5**

Q.3 i. Define the followings: **2**
(a) Ideal and real flow
(b) Steady and unsteady flow

ii. Derive the relation for continuity equation in cartesian coordinates. **8**

OR iii. Explain the different types of head losses occurred in pipes with diagrams. **8**

Q.4 i. Give the classification of turbine. **3**

ii. Explain the working of draft tube with diagram. **7**

OR iii. Explain the working of Pelton wheel turbine with diagram. **7**

Q.5 i. Define the following with diagram- **4**
(a) Manometric head
(b) Gross head

ii. Write the advantages of centrifugal pump over reciprocating pump. **6**

OR iii. What is cavitation and priming? And how to reduce its effect. **6**

Q.6 Attempt any two:

i. Write the name of similarity laws and explain any two of them. **5**

ii. Explain the Buckingham-pi theorem with example. **5**

iii. Explain the following- **5**
(a) Reynolds number
(b) Mach number
(c) Weber number
(d) Euler's number
(e) Froude number

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Marking Scheme

Fluid Mechanics andMachinery (T) - AU3CO47 (T)

Q.1 i) Surface tension _____ **1**
Answer: A) Acts in the plane of the interface normal to any line in the surface

ii) Which of the following statements is correct about the shear stress distribution in circular pipes with laminar flow? **1**
Answer: B) It is parabolic with maximum value at the centre

iii) Which of the following equations is derived from Euler's equation of motion along a streamline? **1**
Answer: A) Bernoulli's equation

i. Which of the following types of flow involves constant velocity magnitude and direction at any given point in the fluid? **1**
Answer: C) Steady flow

ii. Pelton turbines are examples of which type of hydraulic turbines? **1**
Answer: A) Impulse turbines

iii. Which of the following efficiencies represents the ratio of the power delivered by the turbine to the power supplied to the turbine, taking into account losses due to hydraulic and mechanical factors? **1**
Answer: D) Overall efficiency

iv. Which term is defined as the pressure head measured by a mercury or water manometer at the inlet or outlet of a pump? **1**
Answer: A) Manometric head

v. What is the purpose of priming in centrifugal pumps? **1**
Answer: D) To remove air from the pump suction line and casing

vi. Similitude is a concept applicable to the testing of _____ **1**
Answer: c) Engineering models

vii. A model of with same shape is_____ **1**
Answer: a) Geometric similarity

Q.2 i. Define the followings: 1 Marks each **2**
1. Mass density
2. Specific gravity

ii. Explain the term viscosity with diagram. **3**
Definition 1 Marks
Short description 1 Marks
Diagram 1 Marks

iii. Derive the relation for newton's law of viscosity with diagram. **5**
Statement 2 Markss
Derivation 2 Marks
Diagram 1 Marks

OR iv. Derive the relation for hydrostatic force on an inclined surface. **5**
Statement 1 Marks
Derivation 3 Marks
Diagram 1 Marks

Q.3 i. Define the followings: 1 Marks each **2**
1. Ideal and real flow
2. Steady and unsteady flow

ii. Derive the relation for 1-D continuity equation. **8**
Statement 2 Marks
Derivation 4 Marks
Diagram 2 Marks

OR iii. Explain the different types of head losses occurred in pipes with diagrams. **8**
Head loss names 2 Marks
Explanation of each head 4 Marks
Diagram 2 Marks

Q.4 i. Give the classification of turbine. 3 Marks **3**

ii. Explain the working of draft tube with diagram. **7**
Draft tube definition 2 Marks
Working 3 Marks
Diagram 2 Marks

OR iii. Explain the working of Pelton wheel turbine with diagram. **7**
Pelton wheel short explanation 2 Marks
Working 3 Marks
Diagram 2 Marks

Q.5 i. Define the following with diagram 2 Marks each **4**
1. Manometric head
2. Gross head

ii. Write the advantages of centrifugal pump over reciprocating pump. **6**
1 difference Marks

OR iii. What is cavitation and priming? And how to reduce its effect. **6**
Definition of Cavitation 2 Marks
Definition of priming 2 Marks
Effect 2 Marks

Q.6 Attempt any two:

i. Write the name of similarity laws and explain any two of them. **5**
Names 1 Marks

Explanation 2 Marks each

ii. Explain the Buckingham-pi theorem with example. **5**

Statement 2 Marks

Explanation with example 3 Marks

iii. Explain the following 1 Marks each **5**

1. Reynolds number
2. Mach number
3. Weber number
4. Euler's number
5. Froude number

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