

Enrollment No.....



Faculty of Engineering  
End Sem Examination May-2023  
AU3CO27 / FT3CO34 / ME3CO27  
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. The specific gravity of a liquid has- 1  
 (a) The same unit as that of mass density  
 (b) The same unit as that of weight density  
 (c) The same unit as that of specific volume  
 (d) No unit
- ii. Two horizontal plates placed 250 mm have an oil of viscosity 1  
 20 poises. Calculate the shear stress in oil if upper plate is moved with  
 velocity of 1250 mm/s.  
 (a)  $20 \text{ N/m}^2$  (b)  $2 \text{ N/m}^2$  (c)  $10 \text{ N/m}^2$  (d) None of these
- iii. Which method is used exclusively in fluid mechanics? 1  
 (a) Lagrangian method (b) Eulerian method  
 (c) Both (a) and (b) (d) Neither (a) nor (b)
- iv. What is the relationship between Orifice meter diameter and pipe 1  
 diameter?  
 (a) Orifice meter diameter is 0.5 times the pipe diameter  
 (b) Orifice meter diameter is one third times the pipe diameter  
 (c) Orifice meter diameter is one fourth times the pipe diameter  
 (d) Orifice meter diameter is equal to the pipe diameter
- v. Buckets and blades used in a turbine are used to- 1  
 (a) Alter the direction of water (b) Switch off the turbine  
 (c) To regulate the wind speed (d) To regenerate the power

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- vi. The hydraulic efficiency of Pelton turbine will be maximum when blade velocity is equal to \_\_\_\_\_. **1**  
 (a)  $V/2$  (b)  $V/3$  (c)  $V/4$  (d)  $V/5$
- vii. The main function of nozzle is to \_\_\_\_\_. **1**  
 (a) Varying temperatures (b) Pressure variations  
 (c) Load variations (d) Heat variations
- viii. The pump will become incapable of pumping in case of \_\_\_\_\_. **1**  
 (a) Gas bounding (b) Throttle bush  
 (c) Stuffing box (d) Casing breakage
- ix. Which of the following is a use of dimensional analysis? **1**  
 (a) To check the dimensional correctness of an equation  
 (b) To solve the equation dimensionally  
 (c) To get the number of dimensional constants  
 (d) To understand the dimensional equation
- x. Which one of the following is a dimensionless quantity? **1**  
 (a) Mass (b) Weight  
 (c) Specific weight (d) Reynold's number
- Q.2 i. Define Newtons law of viscosity. **2**  
 ii. Calculate density, specific weight & weight of 1 litre of petrol having specific gravity 0.7. **3**  
 iii. Derive an expression for pressure acting on an inclined plane submerged in a liquid. **5**
- OR iv. Derive an expression for Metacentric height of a floating body. **5**
- Q.3 i. Define different types of fluid flow. **2**  
 ii. Derive Euler's equation of motion and then derive Bernoulli's equation from Euler's equation. **8**
- OR iii. The velocity vector in an incompressible flow is given by **8**  
 $V = (6xt + yz^2) i + (3t + xy^2) j + (xy - 2xyz - 6tz) k$   
 Verify whether the continuity equation is satisfied and find the acceleration vector at a point A (1,1,1) at  $t = 1.0$ .
- Q.4 i. What is a draft tube? **3**  
 ii. Explain the working of Francis turbine with labelled sketch. **7**
- OR iii. Explain the working of Pelton wheel turbine with labelled sketch. **7**
- Q.5 i. Define manometric head & gross head. **4**

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- ii. Explain the working of hydraulic pump with diagram. **6**
- OR iii. Give the classification of hydraulic pumps and give its various advantages over reciprocating pumps. **6**
- Q.6 Attempt any two:
- i. Explain various steps involved in Buckingham pie theorem for dimensional analysis. **5**
- ii. Obtain an expression in non-dimensional form for the pressure gradient ( $dp/dx$ ) in a horizontal pipe with flow velocity ( $V$ ), pipe diameter ( $D$ ), fluid density ( $\rho$ ), fluid viscosity ( $\mu$ ) and pipe wall roughness ( $e$ ). **5**
- iii. Consider a steady flow of an incompressible Newtonian fluid through a long, smooth walled, horizontal circular pipe. find the number of non-dimensional parameters involved in the problem. Also, establish the functional relation among these dimensionless parameters. Assume suitable data if required. **5**

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### Marking Scheme

#### AU3CO27-ME3CO27-FT3CO34 (T) Fluid Mechanics and Machinery

Q.1	i)	D		1
	ii)	C		1
	iii)	B		1
	iv)	C		1
	v)	A		1
	vi)	A		1
	vii)	B		1
	viii)	D		1
	ix)	A		1
	x)	D		1
Q.2	i.	Definition	2 mark	2
	ii.	Density, S.W and W	1 mark each	3
	iii.	Deriving expression	5 marks	5
OR	iv.	Deriving expression	5 marks	5
Q.3	i.	Defining types of flow	2 marks	2
	ii.	Euler's equation	6 marks	8
		Bernaulis equation	2 marks	
OR	iii.	Verifying continuity equation	4 marks	8
		Finding acceleration	4 marks	
Q.4	i.	Defining drafts cube	3 marks	3
	ii.	Working 4 marks, Diagram 3 marks		7
OR	iii.	Working 4 marks, Diagram 3 marks		7
Q.5	i.	Working 2 marks, Diagram 2 marks		4
	ii.	Classification 4 marks. Advantages 3 marks		6
OR	iii.	Classification 4 marks. Advantages 3 marks		6
Q.6				

i.	Steps 1 mark each	5
ii.	Complete solution 5 marks	5
iii.	Finding no. of dimensionless parameters 3 marks	5
	Establish relation 2 marks	

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