Enrollment No......................................

Faculty of Engineering
End Sem Examination Dec 2024
AU3CO54
Fundamentals of Thermal & Fluid Engineering
Programme: B.Tech.   Branch/Specialisation: AU (EV)

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.

			Marks	BL	PO	CO	PSO
Q.1	i.	The specific gravity of an unknown liquid is found to be 0.65. What will be its density in kg/m^3? (a) 0.65 (b) 6.5 (c) 65 (d) 650	1	2	01, 02	01	1
	ii.	Ratio of dynamic viscosity and density is called- (a) Velocity gradient (b) Kinematic Viscosity (c) Newton's law of viscosity (d) Specific weight	1	1	01, 02	01	1
	iii.	The velocity vector is given by 4i- 4j+2k. The resultant value of velocity is _____? (a) 2 (b) 10 (c) 6 (d) 36	1	2	01, 02	02	1
	iv.	Which of the following is a type of acceleration in fluid kinematics? (a) Local (b) Convective (c) Both (a) and (b) (d) None of these	1	1	01, 02, 03	02	1
	v.	F.$dt = d$(mv) , this equation is also called as- (a) Moment of momentum equation (b) Impulse momentum equation (c) Euler's equation (d) None of these	1	2	01, 02	03	1
	vi.	Device used for velocity measurement is- (a) Pitot tube (b) Venturimeter (c) Orificmeter (d) None of these	1	1	01, 02	03	1

P.T.O.

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Q.6		Attempt any two:					
	i.	Draw schematic diagram of Rankine cycle and explain its working.	5	2	01, 02	05	1
	ii.	With the help of T-q and P-v plots explain the phase transformation of water.	5	2	01, 02	05	1
	iii.	Derive an expression for the efficiency of Carnot cycle. Draw T-s diagram of Carnot cycle in support of the derivation.	5	2	01, 02	05	1

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Q.		Question	Marks				
	vii.	Which of the following properties remain constant during throttling process? (a) Pressure (b) Enthalpy (c) Temperature (d) None of these	1	1	01, 02	04	1
	viii.	Refrigerator and heat pump operates between same temperature limits. If COP of refrigerator is 5, find the COP of heat pump _____. (a) 4 (b) 3 (c) 5 (d) 6	1	2	01, 02, 06	04	1
	ix.	The ratio of actual thermal efficiency of the powerplant to its corresponding Rankine efficiency is called- (a) Relative efficiency (b) Comparative efficiency (c) Effective efficiency (d) Efficiency factor	1	1	01, 02	05	1
	x.	With increase in the pressure, the saturation temperature of water_____. (a) Decreases (b) Increases (c) Remains constant (d) None of these	1	1	01, 02	05	1
Q.2	i.	Define the following: (a) Relative density (b) Force of buoyancy	2	1	01, 02	01	1
	ii.	Explain in brief different types of fluid.	3	2	01, 02	01	1
	iii.	A plate 0.025 mm distant from a fixed plate moves at 60 cm/s and requires a force of 2 N per unit area i.e., 2 N/m² to maintain this speed. Determine fluid viscosity between the plates.	5	3	01, 02, 03	01	1
OR	iv.	A rectangular plane surface is 2 m wide and 3 m deep, lies in the vertical plane in the water. Determine the total pressure force and position of centre of pressure on the plane surface when its upper edge is horizontal and coincides with water surface.	5	3	01, 02, 03	01	1

Q.		Question	Marks				
Q.3	i.	Write in brief about different types of fluid flow.	4	1		02	1
	ii.	The following cases represent two velocity components, determine the third component of velocity such that they satisfy the continuity equation. (a) $u = x^2+y^2+z^2$; $v = xy^2-yz^2+xy$ (b) $v = 2y^2$, $w = 2xyz$	6	3	01, 02, 03	02	1
OR	iii.	A 30 cm diameter pipe carrying water branches into two pipes of diameter 20 cm and 15 cm respectively. If the average velocity in 30 cm diameter pipe is 2.5 m/s. Find the discharge in the pipe. Also find the velocity in 15 cm pipe, if the average velocity in 20 cm diameter pipe is 2 m/s.	6	3	01, 02, 03	02	1
Q.4	i.	A jet of water of diameter 75 mm strikes on a stationary vertical flat plate normally with a velocity of 20 m/s. Determine the force exerted by jet on the plate.	4	3	01, 02, 03	03	1
	ii.	With the help of neat sketch derive the equation of discharge for venturi-meter.	6	2	01, 02	03	1
OR	iii.	A pipe of diameter 400 mm carries water at a velocity of 25 m/s. The pressure at the points A and B are given as 29.43 N/cm² and 22.563 N/cm² respectively and datum head at A and B are 28 m and 30 m. Find the loss of head between A and B.	6	3	01, 02, 03	03	1
Q.5	i.	Air enters a convergent nozzle with a velocity of 40 m/s. The enthalpy of air decreases by 180 kJ/kg. Determine the exit velocity. Assume adiabatic conditions in nozzle.	4	3	01, 02, 03	04	1
	ii.	Derive expression for steady flow energy equation. Clearly mention all the assumptions along with diagram.	6	2	01, 02	04	1
OR	iii.	Explain both statements of second law of thermodynamics with neat diagram	6	2	01, 02, 03	04	1

Marking Scheme
AU3CO54 (T) Fundamentals of Thermal Fluid & Engineering (T)

Q.1	i)	d) 650	1
	ii)	b) Kinematic Viscosity	1
	iii)	c) 6	1
	iv)	c) Both local & convective	1
	v)	b) Impulse momentum equation	1
	vi)	a) Pitot tube	1
	vii)	b) Enthalpy	1
	viii)	d) 6	1
	ix)	a) Relative efficiency	1
	x)	b) Increases	1

Q.2	i.	1 mark for each definition	2
	ii.	1 mark for each (minimum 3)	3
	iii.	Formula = 1 mark	5
		Viscosity 8.3 x 10^{-5} Ns/m^2 = 4 marks	
OR	iv.	Pressure Force = 88290 N = 2.5 marks	5
		Centre of pressure = 2 m from water surface = 2.5 marks	

Q.3	i.	Minimum 4 types of fluid = 4 marks	4
	ii.	W = -3xz-2xyz+(z^3/3) = 3 marks	6
		U = -4xy-x^2y = 3 marks	
OR	iii.	Q = 0.1767 m^3/s = 3 marks	6
		V = 6.44 m/s = 3 marks	

Q.4	i.	Force = 1766.8 N	4
	ii.	Diagram = 2 marks	6
		Derivation = 4 marks	
OR	iii.	Correct formula = 2 marks	6
		Head loss = 5 m = 4 marks	

Q.5	i.	Correct equation = 2 marks	4
		Exit Velocity = 601.33 m/s = 2 marks	
	ii.	SFEE diagram and assumption = 2 marks	6
		SFEE derivation = 4 marks	
OR	iii.	Each statement 2 marks , 2x 2 = 4 marks	6

		Diagram = 2 marks	
Q.6		Any Two	
	i.	Diagram = 2.5 marks	5
		Working = 2.5 marks	
	ii.	P-v and T-s = 3 marks	5
		Explanation = 2 marks	
	iii.	T-s of carnot = 1 marks	5
		Derivation = 4 marks	

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