Course Code: 20ME0353 **R20**

SIDDARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
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QUESTION BANK (DESCRIPTIVE)

Subject with Code: THERMAL AND FLUID ENGINEERING (20ME0353) **Branches**: **EEE**
Year & Sem: I-B.Tech & I-Sem **Regulation: R20**

UNIT –I

POWER PLANTS

1		Draw a neat sketch of a Thermal Power Plant and Explain the each component in the thermal power plant?	[L4][CO1]	**[12M]**
2		Define cooling towers and it types with neat sketch?	[L1][CO1]	**[12 M]**
3		What is coal handling system? List of it types and explain any three of them with neat diagram?	[L1][CO1]	**[12 M]**
4		Explain the various elements of hydroelectric power station with a neat sketch?	[L2][CO1]	**[12 M]**
5		What is need of Chimney in thermal power plant and their types?	[L1][CO1]	**[12 M]**
6	**a**	Explain different types of thermodynamic systems?	[L2][CO1]	**[6 M]**
	b	Describe in detail about Quasi Static Process with schematic diagram?	[L1][CO1]	**[6 M]**
7	**a**	Define property? Distinguish between intensive property and extensive property with example?	[L1][CO1]	**[7 M]**
	b	Explain following terms state, path, process and cycle?	[L2][CO1]	**[5 M]**
8		What is meant by thermodynamic equilibrium? Explain it types briefly?	[L1][CO1]	**[12 M]**
9		Define the following properties of the system with units?		
	a	Pressure	[L1][CO1]	**[2 M]**
	b	Internal energy	[L1][CO1]	**[2 M]**
	c	Temperature	[L1][CO1]	**[2 M]**
	d	Density	[L1][CO1]	**[2 M]**
	e	Enthalpy	[L1][CO1]	**[2 M]**
	f	Volume	[L1][CO1]	**[2 M]**
10		Identify the thermodynamic systems given below and explain why it is used?		
	a	Fan	[L1][CO1]	**[2 M]**
	b	Compressor	[L1][CO1]	**[2 M]**
	c	Pressure cooker	[L1][CO1]	**[2 M]**
	d	Human	[L1][CO1]	**[2 M]**
	e	Boiler	[L1][CO1]	**[2 M]**
	f	Piston cylinder arrangements without valves	[L1][CO1]	**[2 M]**

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UNIT –II

PURE SUBSTANCES

1		Explain the following terms relating to steam formation :		
	a	Sensible heat of water	[L1][CO2]	**[2 M]**
	b	Latent heat of steam	[L1][CO2]	**[2 M]**
	c	Dryness fraction of steam	[L1][CO2]	**[2 M]**
	d	Enthalpy of wet steam	[L1][CO2]	**[2 M]**
	e	Superheated steam	[L1][CO2]	**[2 M]**
	f	Entropy of Steam	[L1][CO2]	**[2 M]**
2		Draw and explain a P-T and T-S diagram for a pure substance	[L4][CO2]	**[12 M]**
3		A spherical vessel of 0.9 m^3capacity contains steam at 8 bar and 0.9 dryness fraction. Steam is blown off until the pressure drops to 4 bar. The valve is then closed and the steam is allowed to cool until the pressure falls to 3 bar. Assuming that the enthalpy of steam in the vessel remains constant during blowing off periods, determine : (i)The mass of steam blown off; (ii)The dryness fraction of steam in the vessel after cooling; (iii)The heat lost by steam per kg during cooling.	[L3][CO2]	**[12 M]**
4		1000 kg of steam at a pressure of 16 bar and 0.9 dry is generated by a boiler per hour. The steam passes through a super heater via boiler stop valve where its temperature is raised to 380°C. If the temperature of feed water is 30°C, determine (i) The total heat supplied to feed water per hour to produce wet steam. (ii) The total heat absorbed per hour in the super heater. Take specific heat for superheated steam as 2.2 Kj/kg K.	[L3][CO2]	**[12 M]**
5		A vessel having a capacity of 0.05 m^3 contains a mixture of saturated water and saturated steam at a temperature of 245°C. The mass of the liquid present is 10 kg. Find the following : (i)The pressure, (ii) The mass, (iii)The specific volume, (iv)The specific enthalpy, (v)The specific entropy, and (vi)The specific internal energy.	[L3][CO2]	**[12 M]**
6		Classification of boilers? Write a short note on water tube boiler and fire tube boiler with example?	[L4][CO3]	**[12 M]**
7		Briefly explain about economizer and super heater with a neat sketch	[L2][CO3]	**[12 M]**
8	**a**	Describe about air pre heater with a neat sketch	[L1][CO3]	**[4 M]**
	b	Explain water tube boiler with a neat sketch	[L2][CO3]	**[8 M]**
9		Draw and explain a P-V and H-S diagram for a pure substance	[L2][CO3]	**[12 M]**
10		Define the following		
	a	Pressure gauge	[L1][CO3]	**[2 M]**
	b	Water level indicator	[L1][CO3]	**[2 M]**
	c	Fusible plug	[L1][CO3]	**[2 M]**
	d	Blow down cock	[L1][CO3]	**[2 M]**
	e	Stop valve	[L1][CO3]	**[2 M]**
	f	Safety valve	[L1][CO3]	**[2 M]**

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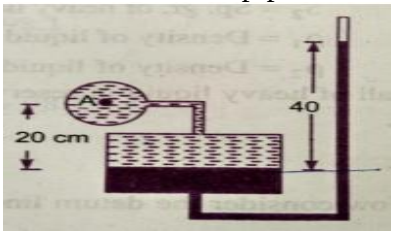
UNIT –III
FLUID PROPERTIES

1	**a**	Define the following fluid properties: Density, specific volume and specific gravity of a fluid.	[L1][CO4]	**[6 M]**
	b	Explain how a U tube manometer is used to measure both positive and negative pressures	[L2][CO4]	**[6 M]**
2	**a**	Write a short note on surface tension and capillarity.	[L1][CO4]	**[6 M]**
	b	Define compressibility and specific weight and write their units.	[L1][CO4]	**[6 M]**
3		Define pressure? List out instruments used to measure pressure and explain any two of the instruments with a neat sketch.	[L1][CO4]	**[12 M]**
4	**a**	Derive an expression for surface tension inside the liquid droplet	[L4][CO4]	**[6 M]**
	b	The surface tension of water in contact with air at 20^0C is 0.0725 N/m. the pressure inside a droplet of water is to be 0.02N/cm^2 greater than the outside pressure. Calculate the diameter of droplet of water.	[L4][CO4]	**[6 M]**
5	**a**	Derive an expression for capillary rise and fall in a glass tube	[L4][CO4]	**[6 M]**
	b	The capillary rise in the glass tube is not to exceed 0.2mm of water. Determine its minimum size, given that surface tension for water in contact with air = 0.0725 N/m	[L4][CO4]	**[6 M]**
6	**a**	Calculate the specific weight, density, specific volume, and specific gravity of one liter of a liquid which weighs 7N	[L4][CO4]	**[6 M]**
	b	Determine the viscosity of a liquid having viscosity 6 stokes and specific gravity 1.9	[L3][CO4]	**[6 M]**
7		Explain U-tube manometer and inverted U- tube manometer with schematic diagram?	[L2][CO4]	**[12 M]**
8	**a**	Write a short note on Pressure variation in a static fluid?	[L1][CO4]	**[6 M]**
	b	Define Atmospheric, gauge and absolute pressures and units of pressure and it conversation?	[L1][CO4]	**[6 M]**
9		A hydraulic press has a ram of 30 cm diameter and a plunger of 4.5 cm diameter. Find the weight lifted by the hydraulic press when the force applied at the plunger is 500 N. An open tank contains water upto a depth of 2 m and above it an oil sp.gr. 0.9 for a depth of 1m. Find the pressure intensity (i) at the interface of the two liquids. And (ii) at the bottom of the tank.	[L4][CO4]	**[12 M]**
10	**a**	What are the gauge pressure and absolute pressure at a point 3m below the free surface of a liquid having a density of 1.53 x 10^3 kg/m^3 if the atmospheric pressure is equivalent to 750 mm of mercury? The specific gravity of mercury is 13.6 and density of water =1000 kg/m^3.	[L4][CO4]	**[6 M]**
	b	A single column manometer is connected to the pipe containing liquid of sp.gr.0.9. Find the pressure in the pipe if the area of the reservoir is 100 times the area of the tube of manometer. sp. gr. of mercury is 13.6.Height of the liquid from the centre of pipe is 20cm and difference in level of mercury is 40cm 	[L4][CO4]	**[6 M]**

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UNIT –IV

FLUID DYNAMICS

1	List out types of flows and explain it?	[L1][CO5]	**[12M]**
2	Derive Euler's equation of motion and Bernoulli's energy equation?	[L4][CO5]	**[12M]**
3	Formulate an expression for discharge measurement by Venturimeter	[L4][CO5]	**[12M]**
4	Develop an expression for Discharge measurement by orifice meter?	[L4][CO5]	**[12M]**
5	Derive an equation for Darcy Weisbach equation?	[L4][CO5]	**[12M]**
6	Derive an expression for the loss of head due to sudden enlargement of a pipe.	[L4][CO5]	**[12M]**
7	Discuss the impulse momentum equation? Derive an expression for force exerted by a fluid flow on bend pipe?	[L5][CO5]	**[12M]**
8	Explain about Energy gradient line and Hydraulic gradient line?	[L2][CO5]	**[12M]**
9	Write a short note on Pipes in Series and Pipes in Parallel and derive expression for it?	[L1][CO5]	**[12M]**
10	Enlist the major and minor loses in pipes. Derive the expression for loss of head due to sudden contraction	[L2][CO5]	**[12M]**

UNIT –V

IMPACT OF JETS

1	**a**	Formulate an expression for force of jets on stationary flat with neat sketch?	[L4][CO6]	**[6 M]**
	b	Find the force exerted by a jet of water of diameter 75 mm on a stationary flat plate, when the jet strikes the plate normally with velocity of 20 m/s.	[L1][CO6]	**[6 M]**
2	**a**	Derive an expression for the force exerted by a jet of water on an inclined fixed plate in the direction of the jet.	[L4][CO6]	**[6 M]**
	b	A jet of water of diameter 50 mm moving with a velocity of 40 m/s, strikes a curved fixed symmetrical plate at the centre. Find the force extracted by Jet of water in the direction of the jet, if the jet is deflected through an angle of 120° at the outlet of the curved plate	[L4][CO6]	**[6 M]**
3	**a**	Derive an expression for the hydraulic efficiency when a liquid jet strikes a single fixed curved vane	[L4][CO6]	**[6 M]**
	b	A jet of 50 mm diameter delivers a stream of water at 20 m/s perpendicular to a plate that moves away from the jet 5 m/s. Find the force on the plate, work done and efficiency of jet.	[L4][CO6]	**[6 M]**
4	**a**	Derive the expression for force and the efficiency by the jet when it strikes at the centre of moving curved plate?	[L4][CO6]	**[6 M]**
	b	A 7.5 cm diameter jet having a velocity of 30 m/s strikes a flat plate, the normal of which is inclined at 45° to the axis of the jet. Find the normal pressure on the plate when (i) the plate is stationary, and (ii) when the plate is moving with a velocity of 15 m/s and away from the jet.	[L4][CO6]	**[6 M]**
5		A jet of water of diameter 50mm moving with a velocity of 25 m/s impinges on a fixed curved plate tangentially at one end at an angle of 30° to the horizontal. Calculate the resultant force of the jet on the plate if the jet is reflected through an angle of 50°. Take g = 10 m/s^2	[L4][CO6]	**[12M]**
6		Explain the working principle of a Pelton wheel with a neat sketch and also derive equation for hydraulic efficiency	[L2][CO6]	**[12M]**
7		What are the working principle and efficiency for Modern Francis turbine?	[L2][CO6]	**[12M]**
8		Derive Expressions for work done and efficiency for Kaplan turbine?	[L4][CO6]	**[12M]**
9		The following data is given for the Francis turbine. Net head H = 60 m, Speed N = 700 r.p.m., Shaft Power = 294.3 kW, ηo = 84 % ηh = 93 %, flow ratio = 0.2, breadth ratio n = 0.1, outer diameter of the runner = 2 X inner diameter of the runner. The thickness of vane occupies 5% of circumferential area of the runner, velocity of flow is constant at inlet and outlet and discharge is radially at outlet. Determine: (i) Guide blade angle, (ii) Runner vane angles at inlet and outlet, (iii) Diameters of runner at inlet and outlet, and (iv) Width of wheel at inlet	[L4][CO6]	**[12M]**
10		A Pelton wheel is to be designed for the following specifications: Shaft power = 11,772 kW, head = 380 m, speed =750 r.p.m, overall efficiency = 86%. Jet diameter is not to exceed one-sixth of the wheel diameter. Determine: (i) The wheel diameter, (ii) The number of jets required and (iii) Diameter of jet. Take Kv1 = 0.985 and K u1 = 0.45.	[L4][CO6]	**[12M]**

Prepared by:

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