SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY :: PUTTUR
(AUTONOMOUS)

QUESTION BANK

Subject with Code: Thermal & Fluid Engineering (**19ME0361**) **Course & Branch**: B. Tech - EEE

Year & Sem : I-B. Tech & I-Sem **Regulation:** R19

UNIT –I

THERMAL POWER PLANT & HYDROELECTRIC POWER STATIONS

1.	Explain the various elements of hydroelectric power station with a neat sketch	12M
2.	Explain the different types of hydroelectric power stations	12M
3.	Explain the factor to be considered for selection of site for steam power plant.	12M
4.	What are the different type of feed water treatments in thermal power plant and explain any two with neat sketch.	12M
5.	Explain important parts in thermal power plant.	12M
6.	Differentiate between the Coal handling and Coal storage	12M
7.	Draw the neat sketch of thermal power plant and explain coal storage system.	12M
8.	Differentiate between the boiler and condenser.	12M
9.	What is need of Chimney in thermal power plant, and their types?	12M
10.	Explain the factor to be considered for selection of site for hydroelectric power plant.	12M

UNIT – II

BASIC CONCEPTS & WORK & HEAT TRANSFER

1		Explain thermodynamics system, surrounding and universal. Distinguish between closed, open, isolated systems. Illustrate with examples.	12M
2	a)	Define property? Distinguish between intensive and extensive property	6M
	b)	Differentiate between the cyclic process and non-cyclic process	6M
3	a)	What do you understand by path function and point function?	6M
	b)	What is heat transfer? What are its positive and negative directions?	6M
4		What is meant by thermodynamics equilibrium? Explains its types briefly.	12M
5	a)	Define and explain Zeroth Law of Thermodynamics	6M
	b)	State first law of thermodynamics. Prove that internal energy is a property of the system.	6M
6		A closed system undergoes a thermodynamic cycle consisting of four separate and distinct processes. The heat and work transferred in each process are as tabulated below.	12M

Process	Heat transfer in kJ/min	Work done in kJ/min
1-2	20,000	0
2-3	-10,000	30,000
3-4	0	20,000
4-1	15,000	-25,000

Show that the data is consistent with the first law of thermodynamics. Also evaluate the network output in kW and the change in internal energy

7	a)	Derive an expression for the availability of an open system	6M
	b)	What are the limitations of the First law of Thermodynamics and explain briefly?	6M
8	a)	State and explain second law of thermodynamics.	6M
	b)	Establish the equivalence of Kelvin-Planck and Clausius statements.	6M
9		Derive the relation between c_p & c_v	12M
10		Explain the following terms with shorts notes	12M

i) State ii) Path iii) Process

iv) Cyclic process v) System.

UNIT – III

PURE SUBSTANCES

1		Draw and explain the P-V, T-H diagram of pure substances.	12M
2	a)	Explain the various operation of a Carnot cycle. Also represent it on T-S and P-V diagrams	6M
	b)	Explain Limitations of Carnot cycle.	6M
3	a)	Describe the different operations of Rankine cycle. Derive also the expression for its efficiency	6M
	b)	A steam power plant works between 40 bar and 0.05 bar. If the steam supplied is dry saturated and the cycle of operation is Rankine, Find (i) cycle efficiency, (ii) Specific steam consumption.	6M
4		Explain any one water tube Boiler with neat sketch	12M
5	a)	Comparison between Rankine cycle and Carnot cycle	6M
	b)	Find the change in enthalpy and entropy of steam, initial pressure 10 bar and 0.98 then it will reach 20 bar and 350 temperature.	6M
6		A power plant operating between 30 bars and 0.02 bars. If the steam supplied is 350 ^{0} C and the cycle of operation is Rankine, Find (i) cycle efficiency, (ii) change in enthalpy.	12M
7	a)	How are boiler classified	6M
	b)	Give the Comparison between fire tube and water tube Boiler	6M
8	a)	Explain the terms with neat sketch. (i) Fusible plug, (ii) feed check valve, (iii) Water level Indicator,	6M
	b)	The following readings were obtained during a boiler trail of 6 hours duration. Mean steam pressure = 12 bar; mass of steam generated = 40000 kg; mean dryness6 fraction = 0.85; mean feed water temperature = 30^0c, coal used = 4000 kg. Calorific valve of coal = 33500 kj/kg. Calculate: (i) Factor of equivalent evaporation; (ii) Equivalent evaporation from and at 100^0c; (iii) Efficiency of the boiler.	6M
9		Explain the terms with neat sketch. (i) Economizer, (ii) Air preheater, (iii) Convective super heater	12M
10		Explain the following terms	
		What are the Boiler mountings and draw the diagrams.	4M
		What are the Boiler accessories	4M
		Safety valve & Pressure gauge	4M

UNIT –IV

Fluid Statics and Kinematics

1. a) Define the following fluid properties: Density, weight density, specific volume and specific gravity of a fluid. 6M

   b) An oil film of thickness 1.5 mm is used for lubrication between a square plate of size 0.9 m × 0.9 m and an inclined plane having an angle of inclination 20^0. The weight of the square plate is 392.4 N and it slides down the plane with a uniform velocity of 0.2 m/s. Find the dynamic viscosity of the oil. 6M

2. a) Explain the terms: (i) Path line (ii) Streak line (iii) Stream line, and (iv) Stream tube. 6M

   b) A pipe of diameter 30 cm carries water at a velocity of 20 m/sec. The pressures at the points A and B are given as 34.335 N/cm^2 and 29.43 N/cm^2 respectively. While the datum head at A and B are 25 m and 28 m, find the loss of head between A and B. 6M

3. a) Two square flat plates of size 50 cm X 50 cm are spaced 12 mm apart and the space between the two is filled with oil of specific gravity 0.95. The lower plate is stationary and on the upper plate a force of 100 N is applied to move it with a velocity of 2.5 m/s. Assuming linear velocity distribution in the oil film determine the dynamic viscosity and kinematic viscosity of the oil. 6M

   b) A 40 cm diameter pipe, conveying water, branches into two pipes of diameter 30 cm and 20 cm respectively. If the average velocity in the 40 cm diameter pipe is 3 m/s. Find the discharge in this pipe. Also determine the velocity in 20 cm pipe if the average velocity in 30 cm diameter pipe is 2 m/s. 6M

4. a) Define the equation of continuity. Obtain an express for continuity equation for a one-dimensional flow. 6M

   b) Water is flowing through a pipe having diameters 30 cm and 15 cm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 29.43 N/cm^2 and the pressure at the upper end is 14.715 N/cm^2. Determine the difference in datum head if the rate of flow through pipe is 50 lit/s. 6M

5. a) What is a manometer? How are they classified? Explain with sketches. 6M

   b) pipe 300 m. long has a slope of 1 in 100 and tapers from 1.2 m diameter at the high end to 0.6 m diameter at the low end. The rate of flow of water through the pipe is 0.10 m^3/sec. If the pressure at the high end is 73.575 kPa, find the pressure at the low end. Neglect losses. 6M

6. a) Explain the types of fluid flows. 6M

b) A 30 cm diameter pipe conveying water, branches into two pipes of diameters 20 cm and 15 cm respectively. If the average velocity in the 30 cm diameter pipe is 2.5 m/s, find the discharge in this pipe. Also determine the velocity in 15 cm pipe if the average velocity in 20 cm diameter pipe is 2 m/s. 6M

7. a) What is Euler's equation of motion? How will you obtain Bernoulli's equation from it? 6M

b) A pipe line carrying oil of specific gravity 0.8, changes in diameter from 300 mm at a position A to 500 mm diameter to a position B which is 5 m at a higher level. If the pressures at A and B are 19.62 N/cm^2 and 14.91 N/cm^2 respectively, and the discharge is 150 liters/s. Determine the loss of head and direction of flow. 6M

8. a) Explain how a U tube manometer is used to measure both positive and negative pressures 6M

b) A U tube manometer is used to measure the pressure of oil of specific gravity 0.85 flowing in a pipe line. Its left end is connected to the pipe and the right limb is open to the atmosphere. The centre of the pipe is 100 mm below the mercury in the right limb. If the difference of mercury level in the two limbs is 160 mm. Determine the absolute pressure of the oil in the pipe. 6M

9. a) Derive an expression for the force exerted by a flowing fluid on a pipe-bend 6M

b) If 5 m^3 of a certain oil weighs 50 kN, calculate specific weight, density and specific gravity of oil. 6M

10. a) Define and distinguish between surface tension and capillarity. 4M

b) What is momentum equation? & Define Viscosity and mention their units. 4M

c) Define Pressure,Vapor pressure &What are the assumptions of Bernoulli's Equation? 4M

UNIT –V

CONDUIT FLOW

1. a) Derive Darcy Weisbach equation. 6M

b) In a pipe of diameter 350 mm and length 75m water is flowing with a velocity of 2.8m/s. Find the head loss due to friction using Darcy Weisbach equation. Assume kinematic viscosity of water is 0.012 stokes. 6M

2. a) Derive equation for loss of head due to sudden enlargement. 6M

b) A horizontal pipe carries water at rate of 0.04m^3/s. its diameter is 300mm reduced to 150mm. calculate the pressure loss across contraction. Take co-efficient of contraction as 0.62 6M

3.	a)	What is a venturimeter? Derive an expression for the discharge through a venturimeter.	6M
	b)	A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to inlet and throat is 10 cm of mercury. Determine the rate of flow. Take C = 0.98.	6M
4.	a)	What are minor losses? Under what circumstances they are negligible.	6M
	b)	An orifice-meter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure gauges fitted upstream and downstream of the orifice meter give readings of 14.715 N/cm^2 and 9.81 N/cm^2 respectively. Find the rate of flow of water through the pipe in liters/s. Take C = 0.6.	6M
5.	a)	What is a pitot-tube? How will you determine the velocity at any point with the help of pitot-tube?	6M
	b)	A 30cm x 15cm venturimeter is inserted in a vertical pipe carrying water, flowing in the upward direction. A differential mercury-manometer connected to the inlet and throat gives a reading of 30 cm. Find the discharge. Take C = 0.98.	6M
6.	a)	Define and explain the terms: (i) Hydraulic gradient line and (ii) Total energy line.	6M
	b)	What is an orifice meter? Derive an expression for the discharge through a orifice meter.	6M
7.		A horizontal pipe line of 40m long is connected to a water tank at one end and discharges freely into atmosphere at other end. First 25m of its length from the tank is 150mm diameter and its diameter suddenly enlarged to 300mm. the height of water level in the tank is 3m above the center of pipe. Consider all losses of heads which occur. Determine the rate of flow, draw hydraulic gradient line and energy gradient line. Take f=0.01 for both sections of the pipe.	6M
8.	a)	Explain flow through nozzle and derive equation.	6M
	b)	A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of water. The pressure at inlet is 17.658 N/cm^2 and the vacuum pressure at the throat is 30 cm of mercury. Find the discharge of water through venturimeter. Take Cd=0.98	6M
9.	a)	Explain the pipes in series and derive equation for total loss of head in pipe	6M
	b)	The rate of flow of water through a pipe of length 2000m and diameter 1m is	6M

$2m^3$/sec. at the end of the pipe a nozzle of outside diameter 300mm is fitted. Find the power transmitted through the nozzle. If the head of water at inlet of the pipe is 200m and coefficient of friction for pipe is 0.01.

10. a) Explain pipes in parallel and series. 6M

    b) Write the equations for loss of head in pipe bends and pipe fittings? 3M

    c) What is meant by hydraulic gradient line? 3M

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