**SIDDHARTH INSTITUTE OF ENGINEERING & 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 the different type feed water treatments in thermal power plant and explain any one. | 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

<table>
<tr><td>1</td><td></td><td>Explain thermodynamics system, surrounding and universal. Distinguish between closed, open, isolated systems. Illustrate with examples.</td><td>12M</td></tr>
<tr><td>2</td><td>a)</td><td>Define property? Distinguish between intensive and extensive property</td><td>6M</td></tr>
<tr><td></td><td>b)</td><td>Differentiate between the cyclic process and non-cyclic process</td><td>6M</td></tr>
<tr><td>3</td><td>a)</td><td>What do you understand by path function and point function?</td><td>6M</td></tr>
<tr><td></td><td>b)</td><td>What is heat transfer? What are its positive and negative directions?</td><td>6M</td></tr>
<tr><td>4</td><td></td><td>What is meant by thermodynamics equilibrium? Explains its types briefly.</td><td>12M</td></tr>
<tr><td>5</td><td>a)</td><td>Define and explain Zeroth Law of Thermodynamics</td><td>6M</td></tr>
<tr><td></td><td>b)</td><td>State first law of thermodynamics. Prove that internal energy is a property of the system.</td><td>6M</td></tr>
<tr><td>6</td><td></td><td>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.
<table>
<tr><th>Process</th><th>Heat transfer in kJ/min</th><th>Work done in kJ/min</th></tr>
<tr><td>1-2</td><td>20,000</td><td>0</td></tr>
<tr><td>2-3</td><td>-10,000</td><td>30,000</td></tr>
<tr><td>3-4</td><td>0</td><td>20,000</td></tr>
<tr><td>4-1</td><td>15,000</td><td>-25,000</td></tr>
</table>
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</td><td>12M</td></tr>
<tr><td>7</td><td>a)</td><td>Derive an expression for the availability of an open system</td><td>6M</td></tr>
<tr><td></td><td>b)</td><td>What are the limitations of the First law of Thermodynamics?</td><td>6M</td></tr>
<tr><td>8</td><td>a)</td><td>State and explain second law of thermodynamics.</td><td>6M</td></tr>
<tr><td></td><td>b)</td><td>Establish the equivalence of Kelvin-Planck and Clausius statements.</td><td>6M</td></tr>
<tr><td>9</td><td></td><td>Derive the relation between $c_p$ & $c_v$</td><td>12M</td></tr>
<tr><td>10</td><td></td><td>Explain the following terms</td><td></td></tr>
<tr><td></td><td></td><td>State</td><td>2M</td></tr>
<tr><td></td><td></td><td>Path</td><td>2M</td></tr>
<tr><td></td><td></td><td>Process</td><td>2M</td></tr>
<tr><td></td><td></td><td>Cyclic process</td><td>4M</td></tr>
<tr><td></td><td></td><td>System.</td><td>2M</td></tr>
</table>

# 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 | | A steam power plant is supplied with dry saturated steam at a pressure of 12 bar and exhausts into a condenser at 0.1 bar, Calculate the Rankine efficiency by using steam tables, and Mollier chart. | 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 | | Calculate the change in enthalpy and entropy of steam, initial pressure 15 bar and 0.9 then it will reach 25 bar and 250 temperature. | 12M |
| 8 | | Draw the P-V and T-S diagrams of Rankine cycle and Carnot cycle | 12M |
| 9 | | A steam power plant is supplied with dry saturated steam at a pressure of 10 bar and exhausts into a condenser at 0.2 bar, Calculate the Rankine efficiency by using steam tables, | 12M |
| 10 | | Explain the following terms<br>a) Change in enthalpy b) Forms of steams c) sensible and latent heat<br>d) dryness fraction | 12M |

## 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) | If 5 $m^3$ of a certain oil weighs 50 kN, calculate specific weight, density and specific gravity of oil. | 6M |
| 2. | | 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. | 12M |
| 3. | | Explain the terms: (i) Path line (ii) Streak line (iii) Stream line, and (iv) Stream tube. | 12M |
| 4. | | 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. | 12M |
| 5. | | Define the equation of continuity. Obtain an express for continuity equation for a one-dimensional flow. | 12M |
| 6. | | What is a manometer? How are they classified? Explain with sketches. | 12M |
| 7. | | Explain the types of fluid flows. Explain any four. | 12M |
| 8. | | 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. | 12M |
| 9. | 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 |
| 10. | | Define and distinguish between surface tension and capillarity with neat sketch | 12M |

## UNIT –V

## CONDUIT FLOW

| | | | |
|---|---|---|---|
| 1. | a) | Derive Darcy Weisbach equation. | 6M |
| | b) | In a pipe of diameter 350 mm and length 76M 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. | | Derive equation for loss of head due to sudden enlargement. | 12M |
| 3. | | 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 | 12M |
| 4. | | What is a venturimeter? Derive an expression for the discharge through a venturimeter. | 12M |
| 5. | | 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. | 12M |
| 6. | 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 |
| 7. | 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 |
| 8. | a) | Define and explain the terms:<br>(i) Hydraulic gradient line and<br>(ii) Total energy line. | 6M |
| | b) | What is a orifice meter? Derive an expression for the discharge through a orifice meter. | 6M |
| 9. | | Explain flow through nozzle and derive equation. | 12M |
| 10. | | Explain the pipes in series and derive equation for total loss of head in pipe | 12M |

Prepared by: **J. SURESH**.