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| Name: | |  | |
| Enrolment No: | | | |
| UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Semester Examination, December 2018 Course: Performance Assessment of Thermal Equipments (EPEC8004) Semester: III Program: M.Tech. – Energy System Time: 03 hrs. Max. Marks: 100 Instructions: All Questions are to be attempted. Maximum marks are mentioned below. | | | |
| SECTION A | | | |
| | | Marks | CO |
| Q 1 | Explain why steam is used as heat transfer medium. | 4 | CO1 |
| Q 2 | Describe Economic Thickness of Insulation | 4 | CO1 |
| Q 3 | Illustrate the types of air dryers | 4 | CO2 |
| Q 4 | Explain the Pump characteristic curve and its utilization | 4 | CO3 |
| Q 5 | Discuss Affinity Laws for Fans & blowers | 4 | CO4 |
| SECTION B | | | |
| Q 6 | Write the guidelines for proper drainage and lay out of steam pipelines. | 10 | CO1 |
| Q 7 | Describe Energy Conservation techniques in compressed air system | 10 | CO2 |
| Q 8 | Compare & explain the reduction of flow at pump by THROTTLING Vs VFD | 10 | CO3 |
| Q 9 | <p>A centrifugal pump is delivering 30 m³/s of water at a discharge pressure of 3 kg/cm²g. The pump suction is 1 meter below the pump center line. Find out the power drawn by the motor if the pump efficiency is 60% and motor efficiency is 92%.</p> <p style="text-align: center;">OR</p> <p>A pump is delivering 50 m³/hr of water with a discharge pressure of 35 metre. The water is drawn from a sump where water level is 5 metre below the pump centerline. The power drawn by the motor is 9.5 kW at 91% motor efficiency. Find out the pump efficiency.</p> | 10 | CO3 |
| SECTION-C | | | |
| Q 10 | <p>A steam pipeline of 100 mm outer diameter is not insulated for 100 meters and supplying steam at 10 kg/cm². Find out the annual fuel savings if the line is properly insulated with 65 mm insulating material. Assume 7000 hours/year of operation. Given:</p> <p style="margin-left: 40px;">Boiler efficiency – 90% , Fuel Oil cost - Rs.13,000/tonne Calorific Value of fuel oil -10,300 kcal/kg, Ambient temperature – 30oC Surface temperature without insulation – 180oC</p> | 20 | CO1 |

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| | Surface temperature after insulation – 75oC | | |
| Q 11 | <p>A fan is driven by a motor through a belt pulley system. The input power to the fan is 36 kW for a 2500 Nm³/hr fluid flow. The motor speed is 2990 RPM and its pulley diameter is 200 mm. The fan pulley diameter is 300 mm. If the flow is to be reduced by 20% by changing the fan pulley size, what should be the diameter of the fan pulley and what will be the power input to the fan ?</p> <p style="text-align: center;">OR</p> <p>Explain Various kind of Fans & Blowers and their applications</p> | 20 | CO4 |

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Program: M.Tech. – Energy System

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Instructions: All Questions are to be attempted. Maximum marks are mentioned below.

SECTION A

| | | Marks | CO |
|-----|---|-------|-----|
| Q 1 | Discuss the advantages of condensate and flash steam recovery in steam system | 4 | CO1 |
| Q 2 | List down the factors affecting Economic Thickness of Insulation | 4 | CO1 |
| Q 3 | Illustrate the components of compressed air system | 4 | CO2 |
| Q 4 | Discuss the characteristics of various types of pumps. | 4 | CO3 |
| Q 5 | Explain the opportunities for power reduction in Fans operation | 4 | CO4 |

SECTION B

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| Q 6 | Explain properties of good refractory | 10 | CO1 |
| Q 7 | Explain the DO's & DON'Ts of Compressed air distribution system | 10 | CO2 |
| Q 8 | Describe Energy Conservation techniques for municipal pumping system | 10 | CO3 |
| Q 9 | A fan is operating at 900 RPM developing a flow of 3000 Nm ³ /hr. at a static pressure of 600 mmWC. What will be the flow and static pressure if the speed is reduced to 600 RPM. OR Explain in detail the family of various kind of Fans & Blowers | 10 | CO4 |

SECTION-C

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| Q 10 | A steam pipeline of 100 mm outer diameter is not insulated for 100 meters and supplying steam at 10 kg/cm ² . Find out the annual fuel savings if the line is properly insulated with 65 mm insulating material. Assume 6000 hours/ year of operation. Given: <div style="margin-left: 40px;"> Boiler efficiency – 80% Fuel oil cost - Rs.15,000/tonne Calorific Value of fuel oil - 10,300 Kcal/kg Surface temperature without insulation – 190oC Surface temperature after insulation – 65oC Ambient temperature – 25oC </div> | 20 | CO1 |
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| Q 11 | <p>A compressed air leakage test was conducted in an engineering industry, which employs a 500 cfm reciprocating compressor. The compressed air system is maintained at the normal loading-unloading settings of 6.5 kg/cm²g and 7 kg/ cm²g respectively. The following was observed for a period of 15 minutes trial:</p> <p style="padding-left: 40px;">On load time = 40 secs Unload time = 120 secs.</p> <p>Subsequently some of the air leakage points were attended and the leakage test was repeated. The following was observed while maintaining the same loading & unloading pressure settings and trial period:</p> <p style="padding-left: 40px;">On load time = 20 secs Unload time = 140 secs.</p> <p>The average power drawn during the above 2 trials was observed as 70 kW during load and 15 kW during unload condition. Calculate the annual cost savings for 5000 hr/ year of compressor operation. Assume energy charge of Rs. 5.00 per kWh.</p> <p style="text-align: center;">OR</p> <p>Explain the type of Air dryers and their advantage / disadvantage</p> | 20 | CO2 |
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