**TU/CDOE**

**TEZPUR UNIVERSITY**

**SEMESTER END EXAMINATION (SPRING) 2021**

**DRE 203: ENERGY EFFICIENCY IN ELECTRICAL UTILITIES**

Total Marks: **70** Time: **3 Hours**

*The figures in the right-hand margin indicate marks for the individual question.*

-----------------------------------------------------------------------------------------------

1. Choose the correct answer: 1x10=10

1. Cooling tower reduces circulation water temperature close to-

(i) wet bulb temperature (ii) dry bulb temperature

(iii) dewpoint temperature (iv) freezing temperature

1. The maximum unbalanced load between phases should not exceed …… % of the capacity of the DG set-

(i) 2 (ii) 10 (iii) 8 (iv) 10

1. The automatic power factor controllers cannot control-

(i) load (ii) voltage (iii) kVAr (iv) PF

1. If inlet and outlet water temperatures of a cooling tower are 40°C and 33°C, respectively and atmospheric WBT is 30 °C then the efficiency of the cooling tower is-

(i) 75% (ii) 70% (iii) 72% (iv) 77%

1. The waste heat potential for a 1100 kVA DG set at 500 kW loading and with 480 ℃ exhaust gas temperature is \_\_\_\_\_\_\_ lakh kCal/hr-

(i) 4.8 (ii)) 3.5 (iii) 3 (iv) 2

1. The acceptable pressure drop in the distribution system at the farthest point of an industrial compressed air network is-

(i) 2 bar (ii) 1 bar (iii) 0.5 bar (iv) 0.3 bar

1. If the speed of a pump is doubled the pump head goes up by-

(i) 2 times (ii) 8 times (iii) 16 times (iv) 4 times

1. An ignitor is a control gear to start a-

(i) SV lamp (ii) CFL (iii) FTL (iv) LED lamp

**P.T.O.**

**TU/CDOE**

**TEZPUR UNIVERSITY**

**SEMESTER END EXAMINATION (SPRING) 2021**

**DRE 203: ENERGY EFFICIENCY IN ELECTRICAL UTILITIES**

Total Marks: **70** Time: **3 Hours**

*The figures in the right-hand margin indicate marks for the individual question.*

-----------------------------------------------------------------------------------------------

1. Choose the correct answer: 1x10=10

1. Cooling tower reduces circulation water temperature close to-

(i) wet bulb temperature (ii) dry bulb temperature

(iii) dewpoint temperature (iv) freezing temperature

1. The maximum unbalanced load between phases should not exceed …… % of the capacity of the DG set-

(i) 2 (ii) 10 (iii) 8 (iv) 10

1. The automatic power factor controllers cannot control-

(i) load (ii) voltage (iii) kVAr (iv) PF

1. If inlet and outlet water temperatures of a cooling tower are 40°C and 33°C, respectively and atmospheric WBT is 30 °C then the efficiency of the cooling tower is-

(i) 75% (ii) 70% (iii) 72% (iv) 77%

1. The waste heat potential for a 1100 kVA DG set at 500 kW loading and with 480 ℃ exhaust gas temperature is \_\_\_\_\_\_\_ lakh kCal/hr-

(i) 4.8 (ii)) 3.5 (iii) 3 (iv) 2

1. The acceptable pressure drop in the distribution system at the farthest point of an industrial compressed air network is-

(i) 2 bar (ii) 1 bar (iii) 0.5 bar (iv) 0.3 bar

1. If the speed of a pump is doubled the pump head goes up by-

(i) 2 times (ii) 8 times (iii) 16 times (iv) 4 times

1. An ignitor is a control gear to start a-

(i) SV lamp (ii) CFL (iii) FTL (iv) LED lamp

**P.T.O.**

I) The percentage reduction in distribution loses when tail end

power factor raised from 0.8 to 0.95 is-

(i) 71% (ii) 29% (iii) 84% (iv) 15.8%

1. The percentage imbalance when line-line voltages are 415 V, 418 V and 408 V is-

(i) 0.32% (ii) 1.44% (iii) 2.50% (iv) 1.05%

2. Explain the simple method of capacity assessment of air compressors.

10

3. A DG set installed in Tezpur University is rated at 1000 kVA, 415V, 1390A, 0.80 PF and 1500 rpm. The full load specific energy production of this DG set as measured by an auditor is 4.0 kWh/liter of fuel and air drawn by the DG set is reported as 14 kg/kg of fuel. The auditor recommended a waste heat recovery system and mentioned a WHR potential of 2.6×105 kCal/hr at the existing exhaust gas temperature of 583 ℃. Estimate the exhaust gas temperature after installation of the proposed WHR system. The specific gravity of diesel is 0.86 and specific heat of flue gas may be considered as 0.25 kCal/kg ℃. 10

4. Explain the possible energy conservation measures in a lighting system of an industrial plant. 9

5. A cooling tower is designed to cool down the process water temperature from 37℃ to 32℃ in 3 concentrating cycles. If the drift loss of the cooling tower is 0.1% evaluate the following for a flow rate of 1260 m3/h:

2+2+2=6

1. Daily make up water requirement
2. Evaporation loss
3. Blow down loss

6. An air handling unit is attached with a 30-kW fan that has a capacity of 2500 Nm3/hr air flow. The fan pulley diameter is around 30 cm. If the flow is reduced by 15% by changing the fan pulley, what should be the diameter of the fan pulley and power input to the fan? 5

7. Explain ten possible energy saving measures for DG sets in a utility.

10

8. Explain the principle of ‘vapour compression refrigeration’ system with

a neat sketch. 10

\*\*\*

1. The percentage reduction in distribution loses when tail end

power factor raised from 0.8 to 0.95 is-

(i) 71% (ii) 29% (iii) 84% (iv) 15.8%

1. The percentage imbalance when line-line voltages are 415 V, 418 V and 408 V is-

(i) 0.32% (ii) 1.44% (iii) 2.50% (iv) 1.05%

2. Explain the simple method of capacity assessment of air compressors.

10

3. A DG set installed in Tezpur University is rated at 1000 kVA, 415V, 1390A, 0.80 PF and 1500 rpm. The full load specific energy production of this DG set as measured by an auditor is 4.0 kWh/liter of fuel and air drawn by the DG set is reported as 14 kg/kg of fuel. The auditor recommended a waste heat recovery system and mentioned a WHR potential of 2.6×105 kCal/hr at the existing exhaust gas temperature of 583 ℃. Estimate the exhaust gas temperature after installation of the proposed WHR system. The specific gravity of diesel is 0.86 and specific heat of flue gas may be considered as 0.25 kCal/kg ℃. 10

4. Explain the possible energy conservation measures in a lighting system of an industrial plant. 9

5. A cooling tower is designed to cool down the process water temperature from 37℃ to 32℃ in 3 concentrating cycles. If the drift loss of the cooling tower is 0.1% evaluate the following for a flow rate of 1260 m3/h:

2+2+2=6

1. Daily make up water requirement
2. Evaporation loss
3. Blow down loss

6. An air handling unit is attached with a 30-kW fan that has a capacity of 2500 Nm3/hr air flow. The fan pulley diameter is around 30 cm. If the flow is reduced by 15% by changing the fan pulley, what should be the diameter of the fan pulley and power input to the fan? 5

7. Explain ten possible energy saving measures for DG sets in a utility.

10

8. Explain the principle of ‘vapour compression refrigeration’ system with

a neat sketch. 10

\*\*\*