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MEEM-302(A)

M.E./M.Tech., III Semester

Examination, December 2020

Energy Efficiency in Electrical Utility

(Elective-II)

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.
ii) All questions carry equal marks.

1. In an air conditioning duct 0.5m×0.5m, the average velocity of air measured by vane anemometer is 28 m/s. The static pressure at suction of the fan is 20 mm WC and at the discharge is 30 mm WC. The three phase induction motor draws 10.8 A at 415 V with a power factor of 0.9. Find out efficiency of the fan if motor efficiency = 90% (Neglect density correction).

2. a) What are the various methods of pump capacity control normally adopted?
   b) List down few energy conservation opportunities in pumping system.

3. Motor Specifications Rated power = 34 kW/45 HP, Voltage = 415 Volt, Current = 57 Amps, Speed = 1475 rpm, Insulation class = F, Frame = LD 200,
   L Connection = Delta No load test Data Voltage, V = 415 Volts, Current I = 16.1 Amps, Frequency, F = 50 Hz, Stator phase resistance at 30°C = 0.264 Ohms, No load power,
   Pnl = 1063.74 Watts

a) Calculate iron plus friction and windage losses

b) Calculate stator resistance at 120°C $R2 = R1 \times \frac{273+t2}{273+t1}$

c) Calculate stator copper losses at operating temperature of resistance at 120°C.

d) Calculate full load slip(s) and rotor input assuming rotor losses are slip times rotor input.

e) Determine motor input assuming that stray losses are 0.5% of the motor rated power.

f) Calculate motor full load efficiency and full load power factor solution.

4. What is a compressor and what are the factors affecting the performance and savings opportunities?

5. Compare the advantages and disadvantages of using Synchronous condenser and capacitor for power factor improvement.

6. a) Explain the working principle of vapour absorption refrigeration system.

   b) What are the types of vapour absorption Refrigeration systems?

7. a) Explain the concept of energy audit in Mechanical systems briefly.

   b) Draw a typical energy balance of a DG Set.

8. Write short notes on any two.

   a) Electrical load management and maximum demand.

   b) Air conditioning system performance.

   c) Energy conservation avenues in lighting system.

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