# Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

**VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)**

**MAKE UP EXAMINATIONS, DEC/JAN 2015**

**SUBJECT: ENERGY AUDITING & MANAGEMENT [ELE 423]**

**REVISED CREDIT SYSTEM**

Time: 3 Hours          05 JANUARY 2016          MAX. MARKS: 50

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**Instructions to Candidates:**

❖ Answer **ANY FIVE FULL** questions.

❖ Missing data may be suitably assumed.

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**1A.** Define Global Warming Potential (GWP) & R/P ratio . List any two examples of gases having a high GWP. — **03**

**1B.** Explain the three classification of energy, with examples. — **03**

**1C.** Explain reforms brought by the Electricity Act, 2003 in the areas of

- Generation, Transmission & Distribution.
- Role of Central Electricity Authority

**04**

**2A.** A plant which runs for 8000 hours a year has a boiler with an efficiency of 80%. The boiler produces steam at 15 kg/cm$^2$. Steam must travel via pipeline to the plant, located at some distance. The diameter of steam pipeline is 100mm and the total length of pipe from the boiler to the plant is 300m. The surface temperature of the non-insulated part of pipeline, which is 150m in length, is 195 °C. The energy manager proposes a project to properly insulate the non-insulated length of the pipeline with 70mm of glass wool with aluminum cladding, so as to reduce the surface temperature to 70 ° C. Find out the fuel and costs savings and the payback period for the project if the proposal were to be accepted. Assume fuel cost is Rs 15/kg with GCV= 14250 kCal/kg, ambient temperature of 25 °C and insulation material is available at Rs 4000 per sq. meter. — **05**

**2B.** A 34 kW/45 HP, 415 Volt Delta connected 3 Phase IM has a full load current of 57 A at 1475 RPM. The No Load data is Applied Voltage = 415 V; No load current = 16.1 A, Frequency = 50 HZ; Stator phase resistance at 30 °C = 0.264 Ohms & No Load power = 1063.74W. Determine

a) Calculate the Core + FW losses
b) Stator copper losses if the operating temperature is 120 °C
c) Motor input (assuming IEC standards)
d) Motor efficiency at full load.

**05**

**3A.** What are the laws of conservation? Skim milk is prepared by the removal of some of the fat from whole milk. This skim milk is found to contain 90.5% water, 3.5% protein, 5.1% carbohydrate, 0.1% fat and 0.8% ash. If the original milk contained 4.5% fat, calculate its composition assuming that only fat was removed to make the skim milk and that there are no losses in the process. — **05**

**3B.** What is the 5S management tool? Explain in details, clearly bringing out the significance of each S, its implementation technique and potential benefits. **05**

**4A.** Salt in crude oil must be removed before the oil can undergo processing in a refinery. The crude oil is fed to a washing unit where a freshwater feed to the unit mixes with the oil and dissolves a portion of the salt contained in the oil. The oil (containing some salt, but no water) is removed from the top of the washer, while the water (containing salt, but no oil) is removed from the bottom. If the spent wash water contains 15% salt and the crude oil contains 5% salt, determine the final concentration of the output products if the ratio of crude oil (with salt) to water is 4:1. **05**

**4B.** With the help of a Sankey Diagram, explain the losses that occur in a standard 3 phase induction motor. How does an energy efficient motor overcome these losses? **05**

**5A.** Scooter Oil Mills, Brahmavar, during a monitoring program produced the following data. Derive the equation for the best fit straight line which describes the production to energy use. Calculate the Pearson's Correlation Coefficient. Perform a CUSUM analysis and comment on the energy consumption pattern.

| Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Production (Ton/Month) | 480 | 540 | 560 | 620 | 420 | 520 | 640 | 620 | 600 |
| Energy Use (TOE/Month) | 440 | 540 | 580 | 480 | 420 | 400 | 580 | 424 | 420 |

**06**

**5B.** With the help of a flowchart, briefly explain the major steps of energy action planning. **04**

**6A.** A community has 500 people. The source of water to the community are borewells and supply of water from the borewell is through hand pump. The depth of the borewell is 20m. Six hand pumps are used to meet the water requirement. Using the following details, compute the cost of water per liter if the project life cycle is 20 years.

- Per capita water consumption – 40 lit/day
- Cost of each hand pump – INR 5000/-
- Cost of digging a borewell – INR 250 per meter
- Life span of a hand pump – 10 years
- Annual Maintenance Cost – INR 1250/- per hand pump
- Rate of interest – 10%
- Inflation rate – 7%

**05**

**6B.** Explain any three ECON for (i) Induction Motors and (ii) Lighting Systems **05**