Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **18EE3003** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ENERGY MANAGEMENT AND AUDIT** | **Max. marks :** | **100** |

**ANSWER ANY FIVE QUESTIONS (5 x 16 = 80 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | With suitable example, elaborate the energy conservation opportunities in an agricultural and household sector. | CO3 | 10 |
| b. | Case Study problem on Fuel Substitution: Atextile process industry replaced old fuel oil fired thermic fluid heater with agro fuel fired heater. The economics of the project are given below:  **Old System**  Type of fuel Firing : Furnace Oil fired heater  GCV : 10,200 kCal/kg  Avg. Thermal Efficiency : 82%  Heat Duty : 15 lakh kCal / hour  Operating Hours : 26 days x 12 month x 24 hours  Fuel cost per hour : 1850 Rs./hr  **Modified System**  **Type of fuel saving = Coconut chips fired Heater**  GCV = 4200 kCal/kg  Average Thermal Efficiency = 72 %  Heat Duty = 15 lakh kCal / hour  Fuel Cost : 720 Rs./hr  Manpower Cost to operate the new system : 10 lakh  Investment for New system : 35 lakh  Calculate the Simple payback period. | CO3 | 6 |
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| 2. | a. | Give the importance of boiler water treatment and explain the external water treatment methods with necessary diagrams. | CO2 | 12 |
| b. | Discuss the term economic thickness of insulation. | CO2 | 4 |
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| 3. | a. | Elaborate the typical billing components of the two-part tariff structure of industrial utility. | CO3 | 10 |
| b. | Briefly describe the methodology of lighting energy audit in an industrial facility. | CO3 | 6 |
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| 4. |  | Explain the steps involved in the force field analysis. Taking your own industry as an example, list down the positive and negative forces. | CO1 | 16 |
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| 5. | a. | Energy consumption and production data were collected for a plant over a period of 18 months. During month 9, a heat recovery system was installed. Using the plant monthly data, estimate the savings made with the heat recovery system by CUMSUM analysis.   |  |  |  | | --- | --- | --- | | **Month** | **Eact - Monthly Energy Use**  **( toe \* / month)** | **P - Monthly Production**  **( tonnes / month)** | | 1 | 340 | 380 | | 2 | 340 | 440 | | 3 | 380 | 460 | | 4 | 380 | 520 | | 5 | 300 | 320 | | 6 | 400 | 520 | | 7 | 280 | 240 | | 8 | 424 | 620 | | 9 | 420 | 600 | | 10 | 400 | 560 | | 11 | 360 | 440 | | 12 | 320 | 360 | | 13 | 340 | 420 | | 14 | 372 | 480 | | 15 | 380 | 540 | | 16 | 280 | 280 | | 17 | 280 | 260 | | 18 | 380 | 500 | | CO5 | 10 |
|  | b. | Discuss the role(s) of BEE in star labeling and also give the importance of labeling in domestic appliances. | CO5 | 6 |
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| 6. | a. | List down the duties and responsibilities of energy auditor in an industry. | CO4 | 7 |
| b. | Briefly discuss the following terms in cogeneration with suitable examples:   1. Topping cycle 2. Botting cycle 3. Heat-to-power ratio | CO4 | 9 |
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| 7. | a. | Discuss the advantages of ceramic fibre with respective properties. | CO3 | 8 |
| b. | Discuss the energy saving opportunities in an industrial lighting system. | CO3 | 8 |
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| **COMPULSORY QUESTION (1 x 20 = 20 Marks)** | | | | |
| 8. | a. | Calculate the internal rate of return for a economizer that will cost Rs.500,000, will last 10 years, and will result in fuel savings of Rs.150,000 each year. | CO6 | 10 |
| b. | Calculate simple payback period for a boiler that cost Rs.50.00 lakhs to purchase and Rs.5 lakhs per year on an average to operate and maintain and is expected to annually save Rs.15 lakhs and also discuss the pros and cons of simple payback period. | CO6 | 6 |
| c. | Name at least four financing options for energy management. | CO6 | 4 |