Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

II SEMESTER M.TECH (ENERGY SYSTEMS & MANAGEMENT)

MAKE UP EXAMINATIONS, JUNE 2018

SUBJECT: ENERGY AUDITING [ELE 5203]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 12 JUNE 2018** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. Define energy management. Explain the different activities to be performed during detailed energy audit. ***(05)***

1B. Explain how the Electricity Act, 2003 has ensured a qualitative transformation in the field of Energy Sector with respect to tariff policies and generation, transmission and distribution of power. ***(03)***

1C. Explain, the advantages and disadvantages of using L.E.D luminaires over conventional luminaires. ***(02)***

2A. Define critical thickness of insulation. Derive an expression for critical thickness of insulation for a cylindrical wire with usual notations. ***(05)***

2B. A PV array of 500W has been installed to pump water from bore well of 20 meters deep, using a submersible motor & pump system to an overhead tank. The length of the pipe required to pump the water is 30 m. Following are the costs involved for sub systems and their life spans:

- PV array- ₹ 400/watt; Life span - 15 years
- Motor & Pump system- ₹100/Watt; Life span – 8 years
- Water Tank = ₹. 45000; Life Span – 20 years
- Pipe cost-₹400/m; Life span – 5 yrs
- Cost of digging bore well – ₹ 500/m
- Maintenance cost – ₹ 3000/yr
- Misc. capital cost : ₹ 100/Watt
- Salvage Value – ₹ 20/- Watt

If interest rate is 10% and inflation is 6%, calculate life cycle cost of the water for the project period of 15 yrs. ***(05)***

3A. With relevant equations discuss briefly how the efficiency of a boiler can be determined by indirect method. ***(05)***

3B. Explain the power flow diagram of an three phase induction motor. Explain the design changes which help an energy efficient motor to reduce its intrinsic losses. ***(05)***

4A. With a neat sketch explain the construction and working principle of Heat pipe. List the advantages and disadvantages. Also mention the important applications. ***(05)***

4B. The Diesel Generator set installed behind the MIT Cafeteria yielded the following data during a one year energy monitoring program.

Month	**Diesel Consumption (lit)**	**Electrical Energy (KW-hr)**
March, 2016	4045	14108
April, 2016	4240	14620
May, 2016	1475	5193
June, 2016	985	3325
July, 2016	280	932
Aug, 2016	170	500
Sept, 2016	220	797
Oct, 2016	1465	5217
Nov,2016	415	1454
Dec, 2016	120	367
Jan, 2017	280	983
Feb, 2017	765	2595

Using linear regression technique, determine the equation of the best fit line for the data given to predict the amount of diesel required if Electricity Generation for the month of March, 2017 is 15000 kWhr. ***(05)***

5A. What is co-generation and what are its merits and demerits? Explain the topping and bottoming cycle of cogeneration system with an example for each? ***(05)***

5B. Explain the role of mass and energy balance in an Energy audit.

A textile dryer is found to consume 4 m3/hour of natural gas with a calorific value of 800 kJ/mole. If the throughput of the dryer is 60kg of wet cloth per hour, drying it from 60% moisture to 5% moisture, estimate the overall thermal efficiency of the dryer taking into account the latent heat of vaporization only. ***(05)***