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MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOVEMBER 2017

SUBJECT: ENERGY AUDITING [ELE 4006]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 23 November 2017** **Max. Marks: 50**

Instructions to Candidates:

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

1A. i. Biomass is an example of ___ energy
ii. ___ in Kerala has a strategic oil reserve
iii. Connected load of ___ kW defines a building as per Energy Conservation Act 2001
iv. UN Framework Convention on Climate Change was signed by over ___ countries in 1992
v. ___ is the benchmarking terminology used for a diesel power plant ***(05)***

1B. List out 5 important things, to be observed when pre-energy auditing the ground floor section of MIT central library ***(05)***

2A. Write a brief note on classification on energy conservation measures ***(06)***

2B. Skim milk is prepared by the removal of some of the fat from the whole milk. This skim milk is found to contain 90 % water, 4 % protein, 5 % carbohydrate, 0.2 % fat and 0.8 % ash. If the original milk contained 4.5 % fat, calculate its composition assuming that only fat was removed to make skim milk and there were no losses in processing ***(04)***

3A. List out the various components of energy action planning ***(04)***

3B. The energy usage & production data over 10 months is as follows

Month	1	2	3	4	5	6	7	8	9	10
Energy Usage (E_a)	170	170	190	190	150	200	180	160	170	190
Production (P)	190	220	230	260	160	280	220	180	210	270

A heat recovery system was installed during month 5. For the E_a v P plot, the best fit curve is found to be $E_c = 0.4\ P + 90$. Determine the Savings to energy consumption ratio after the heat recovery system has taken its effect ***(06)***

4A. Based on NPV, decide which project is to be preferred if discount rate is 8 %

	Investment	1	2	3
Project A	40,000	20,000	20,000	22,000
Project B	20,000	18,000	18,000	18,000

(04)

4B. For the following data, determine the economic choice if both transformers are operating at 80 % capacity. If energy cost = Rs. 5 per unit, discount rate = 10 %, transformer life = 15 years and transformer remains on load for 8500 hours

	Cost	Core Loss	Copper Loss
Transformer 1	3 Lakhs	3 kW	5 kW
Transformer 2	4 Lakhs	2 kW	7 kW

(06)

5A. For the data given, determine the cable choice based on time value of money: load current = 10 A, loading time = 5000 hours, Final temperature rise = 50^0 C, Ambient temperature = 20^0 C, Energy charges = Rs. 5 / unit, Cable length = 100 m, Cable life = 10 years, temperature coefficient = 4.3×10^{-3} per ^{0} C, discount rate = 10 %

(a) Cable 1: Cost = Rs. 200 / m, R_{20^0C} = 0.2 Ω / Km

(b) Cable 2: Cost = Rs. 400 / m, R_{20^0C} = 0.1 Ω / Km ***(05)***

5B. For a 8 kWH load requirement per day, determine the most economic choice between a PV system and diesel generator based on (a) 24 hours power availability (b) 20 years life

PV System

Panel Cost = Rs. 6 Lakhs, Battery cost = Rs. 2 Lakhs, Battery Life = 5 years, Other components (after 10 years) = Rs. 1,50,000, Operation & Maintenance = Rs. 20,000 per year, Discount rate = 7 %

Diesel Generator

DG Cost = Rs. 75,000, DG life = 6 years, Diesel expenses = Rs. 60,000 every year, Operation & Maintenance = Rs. 75,000 per year, Discount rate = 4 % ***(05)***