Q. Code: 889934

Reg. No. | | | | | | | | | | | | | | |

B.E / B.TECH. DEGREE EXAMINATION, MAY 2023

Fifth Semester

EE18009 ENERGY MANAGEMENT AND AUDITING

(Electrical and Electronics Engineering)

(Regulation 2018)

TIME:3 HOURS **MAX. MARKS: 100**

CO 1 Acquire the background required for engineers to meet the role of energy managers and to acquire the skills and techniques required to implement energy management.
CO 2 Learn about basic concepts of economic analysis and load management.
CO 3 Understand the energy management on various electrical equipment.
CO 4 Knowledge on the concepts of metering and factors influencing cost function.
CO 5 Learn about the concept of lighting systems, light sources and various forms of cogeneration

PART- A(10x2=20Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Brief the relationship between Power and Energy with an example.	**1**	**3**
2.	What is energy auditing?	**1**	**2**
3.	List out different Tariff structure.	**2**	**2**
4.	Analyze the term " Time value of Money".	**2**	**4**
5.	Compare the significance of Guaranteed and Apparent efficiency of Motor.	**3**	**4**
6.	Justify the need for power factor improvement with respect to energy conservation.	**3**	**3**
7.	What is burden in Instrument transformer?	**4**	**2**
8.	State the reasons for metering in Energy management process.	**4**	**3**
9.	What are the Energy standards?	**5**	**2**
10.	Analyze the impact of power quality on energy conservation.	**5**	**4**

PART- B (5 x 14 = 70 Marks)

			Marks	CO	RBT LEVEL
11. (a)	(i)	Discriminate the roles of Energy manager and Energy auditor.	**(7)**	**1**	**2**
	(ii)	Discuss the objectives and functions of Energy Accounting	**(7)**	**1**	**2**
		(OR)			
(b)		Describe Energy Monitoring, Targeting and Reporting process for Energy Management in detail.	**(14)**	**1**	**2**

12. (a)	A 100 hp outdoor dip-proof motor which runs 5000h/yr at an operating load of 80% of design, goes out of service. The plant engineer must choose one of the following: Option 1. Rewind the failed motor Option 2: Purchase a new motor of normal operating efficiency. Option 3: Purchase a new motor of higher operating efficiency. Option 1: Rewinding the failed motor -Costs \$1500 plus \$200 installation, and results in a motor operating efficiency of 90.9% for a first year energy operating cost of \$23400, but will last for only 10 years. Option 2: Purchasing a new normal-efficiency motor, costs \$2100 plus \$200 for installation, motor efficiency of 91.9% for a first year energy operating cost \$23100 and will last for 15 years. Option 3: purchasing a new high-efficiency motor costs \$2500 plus \$200 for installation, results in a motor operating efficiency of 94.8% for a first year energy operating cost of \$22,400 and will last for 15 years. Assume, 30 year investment horizon, rate of inflation: 4%/yr and corporate discount rate is set at 20%, Salvage value is equal for three options and Tax effects are not considered. Find the best option.	**(14)**	**2**	**3**
	(OR)				
(b)	Consider the purchase of a 5000kVA, 34500/4160 V, three phase transformer. The peak load is 2500kVA and should grow at a rate of 5% per year. The tail rate demand is \$10 and tail rate energy is 0.10/kWh, and they are expected to increase 12%/yr. Transformer peak and billing peak are coincidental. The factory operates in two shifts for 5 days each week all year. On evenings and sundays the load is approximately 40% of peak. During the 16 hr of production, 4hr see 60% of peak, 4hr see 80% of peak and remaining 8hr are at 2500 kVA. Load curve is identical in all working days and transformer has 28 years life. But if the load grows at 5% each year the transformer will be replaced much sooner than 28 years if it is changed out at name plate. Calculate the years until load reaches name plate value, no load and load losses.	**(14)**	**2**	**3**

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13. (a)	Describe all possible methods to increase motor efficiency.	**(14)**	**3**	**3**
	(OR)			
(b)	Categorize the different types of losses associated with transformers and explicate the transformer energy-saving recommendations.	**(14)**	**3**	**3**
14. (a)	Discuss the operation of simplified utility watt hour meter with neat sketch. Explain the utility level energy management with respect to demand curve and load factor. How will you convert utility meter into demand meter?	**(14)**	**4**	**3**
	(OR)			
(b)	Explain the functions of multitasking solid-state energy meter with a suitable block diagram in energy management. Also, discuss the salient features of meter while applying for energy conservation.	**(14)**	**4**	**3**
15. (a)	**(i)** How will you carry out lighting system design process to achieve optimum use of energy?	**(7)**	**5**	**3**
	(ii) Explain the different types lighting control in detail.	**(7)**	**5**	**3**
	(OR)			
(b)	Elaborate different forms of co-generation. Discuss the feasibility of the same in any two industries.	**(14)**	**5**	**3**

PART- C (1x 10=10Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Analyze motor sizing for the following varying duty cycle given in the table, select a suited motor from the following two options and justify the reason.	**(10)**	**3**	**4**

a) 50 hp motor with a 1.15 safety factor.

b) 60 hp motor with a 1.0 safety factor.

Part of cycle	1	2	3	4	5	6	7	8
Time per cycle, t in seconds	15	40	30	5	148	200	12	70
Horse power required	32	74	27	32	66	27	32	27