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Roll No.

Total No. of Questions : 08

M.Tech.(EE) (2013 Batch E-III) (Sem.-3) **ENERGY EFFICIENT MACHINES** Subject Code : MTEE-301A

Paper ID : [72238]

Max. Marks: 100

(S9)-866

INSTRUCTION TO CANDIDATES :

Time : 3 Hrs.

- 1. Attempt any FIVE questions out of EIGHT questions.
- 2. Each question carries EQUAL marks.

1. Answer briefly :

	a)	Why energy efficient machines are required?	(4)
	b)	How two-part tariff system is designed? Explain.	(4)
	c)	Define Energy Audit and explain how it leads to Energy Management?	(4)
	d)	Classify various energy intensive industries on the basis of energy demand.	(4)
	e)	How a domestic consumer can contribute to energy conservation?	(4)
2.	a)	Draw the torque slip characteristic of a three phase induction motor and discuss motoring, generating and braking regions in it. Explain, why it should always ru the negative slope region of the torque-slip characteristic?	
	b)	Explain how the starting torque of an induction motor is affected by its resistance.	rotor (5)
3.	a)	Discuss various losses in a standard motor and various methods to minimize them	(10)
	b)	What factors improve the efficiency of the energy efficient motor as compared to standard motor? Discuss various standards for energy efficient motors.	the (10)
4.	a)	Why an Induction motor has poor power factor and how it can be improved?	(5)
	b)	Why non-linear loads have poor power factor? Explain.	(5)
	c)	What is the significance of power factor in an AC system?	(5)
	d)	How harmonics are generated in a system? Mention their disadvantages.	(5)



Total No. of Pages : 02

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- 5. a) What losses voltage unbalance and voltage variation can create in an Induction motor? Explain their effect on a motor performance. (10)
 - b) Explain, why the voltage/frequency ratio is kept constant during variable frequency operation of a three phase induction motor? Discuss its operation when supplied from a variable frequency power supply. (10)
- 6. a) What are the methods for speed control of an induction motors? Explain their suitability to various applications. (10)
 - b) How the energy conservation can be achieved while operating a constant torque load in variable speed mode? Justify your answer with a real time example. (10)
- 7. a) Explain the present worth method with constant and increasing power costs and net present worth methods. (10)
 - b) An energy efficient motor of 5 hp rating, 95% efficiency is used as replacement of a same rating standard motor in an industry. The difference cost of energy efficient motor is Rs.6000/- while the efficiency difference is 10%. Calculate the quantity and cost of energy saving along with payback period while considering the energy cost as Rs. 7 per unit. If the industry has 150 such motors, how much demand saving it would have? (10)
- 8. Write short notes on **any two** of the following : (10×2)
 - a) Varying duty applications of Induction motors
 - b) Power factor improvement using auto switched capacitors
 - c) Application of variable frequency drives to fans and pumps