

Total No. of Questions—12]

[Total No. of Printed Pages—7

<b>Seat No.</b>	
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**T.E. (Electrical) (Second Semester) EXAMINATION, 2014**

**ENERGY AUDIT AND MANAGEMENT**

**(2008 PATTERN)**

**Time : Three Hours**

**Maximum Marks : 100**

**N.B. :—** (i) Answers to the two Sections should be written in separate answer-books.

(ii) Answer *three* questions from each Section.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) Figures to the right side indicate full marks.

(v) Use of calculator is allowed.

(vi) Assume suitable data if necessary.

### **SECTION I**

1. (a) Explain impact of increased energy use on environment. [8]
- (b) Explain impact of increased energy use on environment. [8]

P.T.O.

*Or*

- 2.** (a) What are the implications of Electricity Act 2003 ? [8]
- (b) How are energy sources classified ? Write in detail about promising future energy resources. [8]
- 3.** (a) Define energy management. Explain vital elements for successful energy management. [8]
- (b) Give the structure of energy management in industry. Explain the required abilities of energy manager. [10]

*Or*

- 4.** (a) What are the benefits of demand side management ? Explain phases of implementation of demand side management. [10]
- (b) What are the principles of successful energy management ? Explain in detail the ways to optimize the energy requirement. [8]
- 5.** (a) What is the importance of data in energy audit ? Explain ways to analyze data related to energy and production. [8]

- (b) In an industrial unit, monthly production related energy consumption was 1.5 times the production and non-production related energy consumption was 16,000 kWh per month up to Jan. 2014. In the month of July 2013 a series of energy conservation measures were implemented. Use CUMSUM technique to evaluate the performance of energy conservation measures so as to reporting it to management about continuation of measures or not : [8]

<b>Months</b>	<b>Production (kg)</b>	<b>Actual Energy Consumption</b> (kWh)
Aug. 13	62000	113600
Sept. 13	71000	139000
Oct. 13	75000	158000
Nov. 13	59000	119300
Dec. 13	62000	123700
Jan. 14	73000	143600

*Or*

6. (a) Explain requirements of energy action planning. [8]
- (b) The following measurements were noted on test rig regarding units produced and energy required for producing the goods. Formulate energy and production relationship by using least square : [8]

Goods Produced (P)	Energy Required (E)
2	4.08
4	11.1
6	30.13
8	81.1
10	222.6

## SECTION II

7. (a) Investment for a set of interrelated energy efficiency projects identified in a medium size process plant works out to Rs. 14.00 lacs. Annual savings for the first five consecutive years are Rs. 3,00,000 Rs. 4,00,000, Rs. 4,00,000, Rs. 4,50,000 and Rs. 3,00,000 respectively. The cost of capital is 12% p.a. What is the Net Present Value (NPV) ? As per NPV, suggest whether the plant can go ahead with the projects. [9]

- (b) Explain criteria for financial appraisal of investment required for energy conservation projects. Also explain limitations of simple payback period. [9]

*Or*

8. (a) Calculate the annual energy savings and payback period for replacing an existing standard motor with premium efficiency motor. The data is given below :

Description	Standard Motor	Premium Motor
Rating	15 kW	15 kW
Loading	75%	75%
Operating hours	8000	8000
Efficiency	88.3%	93.5%
Power factor at given loading	0.85 lag	0.89 lag
Cost of motor	—	Rs. 40,000
Scrap value	Rs. 5,000	—

Take rate of electricity as Rs. 5/unit and demand charges of Rs. 310/kVA/month. [9]

(b) Write in detail about : [9]

(1) Time of Day Tariff

(2) Apparent Energy Tariff.

9. (a) Discuss energy conservation opportunities in boiler and steam systems. [8]

(b) Explain with reference to energy conservation in motors : [8]

(i) Torque speed characteristics of motor and load

(ii) Effect of speed on motor performance

(iii) Effect of unbalance supply.

(iv) Effect of harmonics.

*Or*

10. (a) (i) In a plant, the following observations are noted for clear water pump. Calculate diameter of impeller which is suitable for existing pump. The existing impeller diameter is of 380 mm : [4]

Parameter	Rated	Required
Flow m <sup>3</sup> /h	310	280
Head m	45	43.5
Power kW	55	46

(ii) Enlist energy conservation measures in DG sets. [4]

- (b) Explain various energy conservation measures in compressors and industrial grade fans. [8]
11. (a) During energy audit of paper and pulp industry audit team reported certain inefficiencies in processes and reported to management. What may be the general contents of report and recommendations ? [8]
- (b) Energy audit is carried out for utility substations where T&D losses are considerable. Suggest appropriate measures to curb these losses. [8]

*Or*

12. Present energy audit case studies for the following industries : [16]
- (a) Cement industry
- (b) Chemical and Fertilizer industry.