Scheme – G

Sample Question Paper

Course Name : Diploma in Electrical Engineering Group

Course Code : EE/EP **17506**

Semester : Fifth

Subject Title : Energy Conservation & Audit

Marks : 100 **Time: 3 Hrs**

Instructions:

1. All questions are compulsory
2. Illustrate your answers with neat sketches wherever necessary
3. Figures to the right indicate full marks
4. Assume suitable data if necessary
5. Preferably, write the answers in sequential order

Q1 (A) Attempt any THREE of the following. **12 Marks**

i) State the meaning and need of Energy Conservation.

ii) Define the following terms :

1) Illuminance
2) Lux
3) Luminous Efficacy
4) Colour Rendering Index

iii) State any four benefits of Variable Frequency Drives (VFDs).

iv) List any four factors to be considered while selecting motor for any particular application.

Q1 (B) Attempt any ONE of the following. **06 Marks**

i) How energy efficiency improvement is achieved in Energy Efficiency Motor for following power loss area: i) Iron ii) Stator and Rotor I^2R iii) Friction and Windage?

ii) A 10 HP electric motor is being used 10 hrs. per week to grind feed. A new replacement motor is estimated to save 5 kwh of energy during each hrs. of operation. If replacement cost for 10 HP motor is Rs. 45000/- calculate simple pay back period. Assume electricity cost of Rs. 4.50 per kwh.

Q2. Attempt any FOUR of the following. **16 Marks**

a) Describe the procedure for assessing existing lighting system in a facility.

b) Describe energy conservation technique using light controlled gear in lighting system.

c) Compare conventional core transformer with amorphous core transformer on the basis of i) Construction ii) Material used iii) Losses and iv) Cost.

d) How parameters of transmission line effects the performance of transmission line?

e) Estimate the number and wattage of lamps which would be required to illuminate a workshop space 60m x 15m by means of lamps mounted 5m above the working plane. The average illumination required is about 100 lux, coefficient of utilization is 0.4, luminous efficiency 16 lumens per watt. Assume a space-height ratio of unity and a candle power depreciation of 20%.

f) A 50 kw induction motor with 86% full load efficiency is being considered for replacement by a 89% efficiency motor. What will be the saving in energy if motor works for 6000 hrs. per year and cost of energy is Rs. 4.50 per kwh?

Q3. Attempt any FOUR of the following. 16 Marks

a) Write stepwise procedure to calculate Installed Load Efficacy and Installed Load Efficacy Ratio of an interior general lighting installation.

b) State the opportunities for energy conservation techniques in transformer.

c) Describe the following energy conservation methods of electrical motor:

i) Matching motor rating with required load

ii) Improving Power Quality

d) Describe the use of Epoxy Resin Cast / Encapsulated Dry Type Transformer from energy conservation point of view.

e) How energy conservation is done in transmission and distribution system by i) Reducing I^2R losses and ii) Compensating reactive power flow?

Q4 (A) Attempt any THREE of the following. 12 Marks

i) State any four objectives of Tariff System.

ii) State classification of Cogeneration System on the basis of i) Sequence of energy use and ii) Technology.

iii) What is the effect of following on energy conservation?

1) Power Factor (P.F.) 2) Load Factor (L.F.)

iv) What are the various costs which have to be taken into account in fixation of Tariff?

Q4 (B) Attempt any ONE of the following. 06 Marks

i) How system voltage optimization and phase current balancing helps in energy conservation in transmission and distribution system?

ii) An industry has an annual energy consumption of 200000 kwh at a load factor of 0.35. The tariff is Rs. 4000/- + Rs. 1200/- per kw of maximum demand + Rs. 2.20/- per kwh i) Find its

annual bill ii) What is the bill if total energy consumption is the same but load factor improved to 0.55? iii) What is the bill if energy consumption is reduced by 25% and load factor remains at the same initial value of 0.35?

Q5. Attempt any FOUR of the following. 16 Marks

a) State the technical and commercial losses in transmission and distribution system.

b) List any four energy conservation equipments each related to i) Lighting System and ii) Electrical Motors.

c) Describe layout diagram of Gas Turbine Cogeneration System.

d) Describe the working principle of Automatic Power Factor Controller.

e) Describe the working of Soft Starter and state its advantages over conventional starters.

f) Describe the working principle and operation of Maximum Demand Controller.

Q6. Attempt any FOUR of the following. 16 Marks

a) Describe an energy flow diagram for industrial plant with the help of sketch.

b) What is ABC analysis? State its advantages referred to energy audit projects.

c) The steam and electricity requirement of an industry is 75000 kg of steam and 5000 kwh of electricity per month. 1 kg of coal produces about 5 kg of steam. If cogeneration is used additional coal requirement to produce electricity is about 10%. If coal is used only for power generation the coal consumption is about 0.6 kg / kwh. Find saving in coal if cogeneration is used. Assume 20% losses in auxiliary, transmission and distribution.

d) States whether the following statement is true or false also justify your answer. “When electricity produced by an industry through a cogeneration system, is sold to utility the price of electricity should be neither too low nor too high”

e) “Measurements are an essential part of energy audit”. Justify the statement.