Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(EE)/SEP.SUPPLE/SEM-8/EE-801C/2012

2012

ENERGY MANAGEMENT AND AUDIT

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) Energy consumption per unit of GDP is called
      a) Energy ratio
      b) Energy intensity
      c) Per capita consumption
      d) none of these.

   ii) Generation, transportation and distribution of electricity is carried out by
      a) Power Development Corporation
      b) NTPC
      c) DVC
      d) NHPC.

iii) The Act which has been enacted to make qualitative transformation in the power sector is
   a) Regulatory Commission Act, 1998
   b) Indian Electricity Act, 1910
   c) Energy Conservation Act, 2001
   d) Electricity Act, 2003.

iv) If supply voltage drops by 5% in GSL Lamp, the energy drawn by the lamp reduces by
   a) 9% b) 9·75%
   c) 10% d) 90%.

v) A 400 watt mercury vapour lamp was switched on for 10 hours per day. The supply volt is 230V. The power consumption per day is
   a) 3·0 kWh b) 3·7 kWh
   c) 3·2 kWh d) 4·5 kWh.

vi) The term missing in the following equation for 3-phase AC supply reactive power = $\sqrt{3} \times VI \times$ ....., is
   a) $\cos\phi$ b) $\tan\phi$
   c) $\sin\phi$ d) $\cot\phi$.

vii) How power factor of a distributor rated for 100A at 415V, three phase, 50 Hz could be improved from 0·5 lagging to 0·97 lagging ?
   a) Installation of series capacitor
   b) Installation of shunt capacitor
   c) Installation of overexcited synchronous motor
   d) Installation of underexcited synchronous motor.

viii) Which of the following can improve load factor of an electrical system ?
   a) Increased average load
   b) Decreased average load
   c) Increased maximum demand
   d) Increase in connected load.

ix) Inexhaustible energy sources are known as
   a) Commercial Energy b) Renewable Energy
   c) Primary Energy d) Secondary Energy.

x) Energy supplied by combustion of fuel is equal to
   a) mass of fuel consumed × its calorific value
   b) mass of fuel consumed × its density
   c) mass of fuel consumed × its specific heat
   d) mass of fuel consumed × temperature difference.

xi) A generator may be used on the basis of
   a) maximum efficiency b) maximum output
   c) minimum loss d) minimum cost.

xii) Choose the correct statement.
   a) Greenhouse gases make up only 10% of the atmosphere
   b) Methane and Nitrous oxide are not greenhouse gases
   c) CO_2 is responsible for at least 60% of the 'enhanced greenhouse effect'
   d) The escape of slow-moving re-emitted infrared radiation is accelerated by the presence of greenhouse gases.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. What are the benefits of bench marking of energy consumption ?
3. What are the deliverables of an Energy Management Program ?
4. What are the needs for Energy Audit ?
5. In order to burn a fuel completely, four basic conditions must be fulfilled. Explain the four basic conditions. What are three *T*s ?
6. Is there any relation between energy production and global warming ? If so, what should be done ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Classify the different types of energy. Discuss each type in brief and also explain these types of energy conversion into electricity.

   b) Discuss the various reforms in the energy sector. 8 + 7

8. a) Define Energy Audit as per the Energy Conservation Act, 2001.

   b) Discuss the procedure for Detailed Energy Audit. What are the baseline data that an audit team should collect while conducting detailed energy audit ? 5 + 10

9. Discuss in detail one Case Study for implementation of an Energy Management Program using Variable Frequency Electric Motors.

10. a) Briefly explain the functions of electronic ballast.

    b) Name at least two applications each for 'Photo-sensors' and 'Timer-controls'.

    c) Explain at least two automatic power factor control methods. 5 + 5 + 5

11. For a 50 MW generating plant, initial capital investment = Rs. 15,00,000, Annual tax = Rs. 40,000, Annual Salary and Wages = Rs. 12,00,000, Cost of coal = Rs. 65 per ton, Calorific value of coal = 5500 kcal/kg, Rate of interest and depreciation = 12%.

    Plant heat rate = 33000 kcal/kWh at 100% capacity,

    = 40000 kcal/kWh at 60% capacity.

    Calculate generating cost per kWh at 100% and 60% capacity.

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