

Question Paper Details					
Course	Stream	Semester	Subject	Paper Code	Chapter
B.Tech	EE	8	Energy Management and Audit	EE-801C	1

Paper Setter Details			
Name	Designation	Mobile No.	Email Id
Sourav Karmakar	Asst. Professor	9903527087	sourav.kkr91@gmail.com

Chapter 1: Energy management and Audit

Part – I: Objective type questions

1. “The judicious and effective use of energy to maximise profits and enhance competitive positions”. This can be the definition of:

- a) Energy conservation
- b) Energy management
- c) Energy policy
- d) Energy Audit

2. The energy management function is generally vested in –

- (a) Senior Management
- (b) One energy manager or co-ordinator
- (c) Distributed among number of middle manager
- (d) (b) & (c) together

3. The objective of energy management includes

- a) Minimising energy costs
- b) Minimising waste
- c) Minimising environmental degradation
- d) All the above

4. The ratio of current year’s production to the reference year’s production is called as

- a) Demand factor
- b) Production factor
- c) Utilisation factor

d) Load factor

5. Replacement of steam based hot water generation by solar system is an example of

a) Matching energy usage to the requirement

b) Maximising system efficiency

c) Energy substitution

d) Performance improvement

6. One unit of electricity is equivalent to ___ kcal heat units.

a) 800

b) 860

c) 400

d) 680

7. The benchmarking parameter for air conditioning equipment is

a) kW/Ton of Refrigeration

b) kW/ kg of refrigerant handled

c) kcal/m³ of chilled water

d) Differential temperature across chiller

8. The percentage of energy saved at the current rate of use, compared to the reference year rate of use, is called

a) Energy Utilization

b) Energy Performance

c) Energy Efficiency

d) None

9. Which instrument is used to monitor O₂, CO in flue gas? (EA)

a) Combustion analyzer

b) Power analyzer

c) Pyrometer

d) Fyrite

10. Lux meter is used to measure.....

a) Illumination level

b) Sound intensity and illumination level

c) Harmonics

d) Speed

11. For a cement plant the parameter, “kWh/MT of clinker “indicates

a) Energy Index parameter

b) Utility factor

c) Production factor

d) Load factor

12. Energy manger should be well versed with

a) Manufacturing and processing skills

b) Managerial and technical skills

c) Technical and marketing skills

d) Managerial and commercial skills

13. An energy policy does not include

a) Target energy consumption reduction

b) Time period for reduction

c) Declaration of top management commitment

d) Future production projection

14. CO₂ measurement of Fyrite kit is based on

a) Weight basis (dry)

b) Volume basis (dry)

c) Weight basis (wet)

d) Volume basis (wet)

15. Non-contact speed measurements can be carried out by

a) Tachometer

b) Stroboscope

c) Oscilloscope

d) Speedometer

16. The tool used for performance assessment and logical evaluation of avenues for improvement in Energy management and audit is

a) Fuel substitution

b) Monitoring and verification

c) Energy pricing

d) Bench marking

17. Infrared thermometer is used to measure

a) Surface temperature

b) Flame temperature

c) Flue gas temperature

d) Hot water temperature

18. Find out the 'odd' among the following choices for fuel substitution for industrial sector of India.

a) LDO with LSHS

b) Coal with rice husk

c) Natural gas for fertilizer plant

d) LPG for soft coke

19. The various types of the instruments, which requires during audit need to be

a) Easy to carry

b) Easy to operate

c) Inexpensive

d) All (a) to (c)

20. Air velocity in ducts can be measured by using ____ and manometer

a) Orifice meter

b) Borden gauge

c) Pitot tube

d) Anemometer

Part – II: Short type questions

1. List any four important factors involved in deciding final cost of purchased electricity.

2. What are the principles of energy management?

3. What is the need for managerial skills in energy management?

4. What do you mean by energy audit?

5. Explain how matching energy usage to requirement can enhance energy efficiency

6. Give any four bench marking parameters followed in equipment/utility related in Industries.

7. List any one energy audit instrument used for power measurement and one for flue gas measurement along with parameters to be measured?

8. What is the significance of an energy policy?
9. How do you classify energy conservation measures?
10. Define 'energy management'.
11. List steps involved in pre-audit phase.
12. What are the factors to be considered before procuring fuels for energy efficiency and economics?
13. What are the few comparative factors need to be looked in to for external benchmarking used for inter-unit comparison and group of similar units?
14. What is the objective of energy management?
15. What are the few important technical feasibility parameters that one should consider during analysis of energy conservation opportunities?
16. Define the energy audit as per the Energy Conservation Act 2001?
17. What do you understand by 'plant energy performance' (PEP)?
18. What are fuel substitution and list one example of fuel substitution?
19. What are the base line data that an audit team should collect while conducting detailed energy audit?
20. List at least four examples falling under "optimising the input energy requirements" while maximizing system efficiency.

Part – III Long type questions

1. Briefly explain with examples on fuel and energy substitution
2. Distinguish between 'preliminary energy audit' and 'detailed energy audit'?
3. Give a typical energy audit reporting format.
4. Write down the steps involved in 'Energy management Strategy'? (EA)
5. List steps involved in 'detailed energy audit'.

Question Paper Details					
Course	Stream	Semester	Subject	Paper Code	Chapter
B.Tech	EE	8	Energy Management and Audit	EE-801C	2

Paper Setter Details			
Name	Designation	Mobile No.	Email Id
Sourav Karmakar	Asst. Professor	9903527087	sourav.kkr91@gmail.com

Chapter 2: Energy Scenario

MCQ Type: 1 mark

1. The energy sources that are either found or stored in nature are

- a) Secondary Energy Sources
- b) Primary Energy Sources
- c) both (a) and (b)
- d) none of the above

2. Which of the following is commercial energy source?

- a) Electricity
- b) Coal
- c) Oil
- d) All the above

3. Inexhaustible energy sources are known as

- a) commercial Energy
- b) renewable Energy
- c) primary energy
- d) secondary energy

4. Which country has the largest share of the global coal reserves?

- a) Russia
- b) China
- c) USA

d) India

5. The % of gas reserves for Russian Federation, when compared to world reserve is considered at

a) 10 % of World reserve

b) 20 % of World reserve

c) 30 % of World reserve

d) 40 % of World reserve

6. World oil reserves are estimated to last over

a) 45 years

b) 60 years

c) 200 years

d) 75 years

7. World gas reserves are estimated to last over

a) 45 years

b) 65 years

c) 200 years

d) 75 years

8. The global primary energy consumption (2002) was equivalent to

a) 21,842 Mtoe

b) 15,360 Mtoe

c) 9405 Mtoe

d) 12,396 Mtoe

9. The primary energy consumption of India is

a) 1/29 of the world

b) 1/16 of the world

c) 1/7 of the world

d) 1/20 of the world

10. The world average per person energy consumption is equivalent to _____ tonnes of coal

a) 3

b) 2.2

c) 4.5

d) 1.0

11. Which fuel dominates the energy mix in Indian energy scenario?

a) Oil

b) Natural gas

c) Coal

d) Nuclear

12. The fourth largest producer of coal and lignite in the world is _____

a) USA

b) Russia

c) India

d) China

13. Indian per capita energy consumption is ____ of the world average.

a) 4%

b) 20%

c) 1%

d) 10%

14. Energy consumption per unit of GDP is called as:

a) Energy Ratio

b) Energy intensity

c) Per capita consumption

d) None

15. India's energy intensity is ____ times of world average.

a) 1.5

b) 2.5

c) 3.6

d) 10

16. India's current percentage peak demand shortage for electricity is:

- a) 1%
- b) 3%
- c) 10%
- d) 14%

17. ABT stands for

- a) Advanced Bi-monthly Tariff
- b) Availability Based Tariff
- c) Accepted Basic Tariff
- d) None of these

18. Which of the following is termed as TOD scheme?

- a) offering cheap electricity during OFF - peak load period
- b) offering cheap electricity during peak load period
- c) offering cheap electricity any time during the period

Short Answer Type: 2 marks

1. Classify the types of the energy available on the earth?
2. Briefly mention about primary sources of energy?
3. What is renewable energy and list at least three renewable energy sources?
4. Name the five states in India, where coal production is concentrated.
5. Define Reserve to 'Production Ratio'?
6. How do you define 'Final Energy Consumption'?
7. Why developed countries have been able to maintain low ratio of energy to GDP?
8. What is Energy intensity and what does it indicate?
9. Mention the parameters on which the high tension and low tension consumers are charged by electricity boards.

Subjective Type: 3 marks

1. What are the two major anthropogenic causes for the generation of Carbon dioxide in the atmosphere?
3. What is the basis for aim of Energy Security for any country?
4. Differentiate between Energy Conservation and Energy Efficiency?
5. How energy cost of electrical energy has helped to develop 'two-part' Tariff?
7. State the importance of 'TOD' tariff.

Broad Type: 5 marks

1. List the strategies for better energy security of the nation?
2. Mention some of the long-term energy strategies available for the better energy secured nation?
3. How do an Industry, nation and globe would benefit from energy efficiency programs?
4. How energy pricing is done in India?
5. Briefly describe the economic reforms in coal, oil and natural gas and electricity sectors.
6. Discuss the electricity rate tariff structure.

Question Paper Details					
Course	Stream	Semester	Subject	Paper Code	Chapter
B.Tech	EE	8	Energy Management and Audit	EE-801C	3

Paper Setter Details			
Name	Designation	Mobile No.	Email Id
Sourav Karmakar	Asst. Professor	9903527087	sourav.kkr91@gmail.com

Chapter 3: Energy Conservation Act-2001 and related policies

MCQ Type: 1 mark

1. B.E.E stands for

- (a) Board of energy efficiency
- (b) Bureau of energy efficiency
- (c) Branch of energy efficiency
- (d) None of these

2. Salient feature of Energy Conservation Act 2001 is

- (a) establishment of BEE
- (b) to prescribe energy conservation building codes for all buildings
- (c) to specify energy consumption standard
- (d) both (a) & (c)

3. The Act which is proposed to bring the qualitative transformation of the electricity sector is

- (a) Regulatory Commission Act, 1998
- (b) Indian Electricity Act, 1910
- (c) Electricity Act, 2003
- (d) Supply Act, 1948

Short Answer Type: 2 marks

1. State the importance of Indian Energy Conservation Act regarding energy policies of industries.

2. List down at least five designated consumers specified by the BEE?

Subjective Type/ Broad Type: 3/5 marks

1. Write short note on Energy Conservation Act, 2001.

2. What are the schemes of Bureau of Energy Efficiency?

3. Write short note on Electricity Act, 2003.

4. Write short note on Integrated Energy Policy.

5. How Bureau of Energy Efficiency (BEE) facilitates energy efficiency programs in India?

Question Paper Details					
Course	Stream	Semester	Subject	Paper Code	Chapter
B.Tech	EE	8	Energy Management and Audit	EE-801C	4

Paper Setter Details			
Name	Designation	Mobile No.	Email Id
Sourav Karmakar	Asst. Professor	9903527087	sourav.kkr91@gmail.com

Chapter 4: Energy Efficiency and Climate changes:

MCQ Type: 1 mark

1. Which of the following is a Greenhouse Gas?

- (a) Carbon Monoxide
- (b) Water Vapour
- (c) Nitrogen dioxide
- (d) Ethane

2. GHG stands for

- (a) Generated Hydrogen Gas
- (b) Gamma Hyperactive Gas
- (c) Generally Hydrated Gas
- (d) Greenhouse Gas

3. The contribution of carbon dioxide to the greenhouse effect is

- (a) 23 %
- (b) 90%
- (c) 30%
- (d) 0%

4. Environmental impact of coal generation is

- (a) ash
- (b) stack products(SO₂, NO_x,CO,CO₂)
- (c) Submerged land

(d) Both (a) & (b)

5. Biogas is a gaseous product consisting of

(a) methane

(b) CO₂

(c) CO

(d) Both (a) & (b)

6. The ozone depletion process is due to

(a) carbon dioxide

(b) chlorine atoms destroying ozone molecules

(c) UV light

(d) CHC & PFC molecules

7. Which of the following is highest contributor to the air pollution?

a) Carbon Monoxide

b) Hydro Carbons

c) Sulphur Oxides

d) Particulates

8. Projected temperature increase in degree centigrade due to climate change is:

a) 2

b) 4

c) 6

d) 8

9. Acid rain is caused by the release of the following components from combustion of fuels.

a) SO_x and NO_x

b) SO_x and CO₂

c) CO₂ and NO_x

d) H₂O

Short Answer Type: 2 marks

1. What were the objectives of United Nations Framework Convention on climate change, 1992 (UNFCCC)?
2. What were the objectives of Kyoto Protocol?
3. List down at least three effects of acid rain?

Subjective Type/ Broad Type: 3/5 marks

1. Discuss Global Warming and Ozone Depletion.
2. Write short note on United Nations Framework Convention on climate change, 1992 (UNFCCC).
3. Write short note on Kyoto Protocol.
4. What are the operating details of CDM?
5. How a nation benefits from Energy Efficiency programs?

Question Paper Details					
Course	Stream	Semester	Subject	Paper Code	Chapter
B.Tech	EE	8	Energy Management and Audit	EE-801C	5

Paper Setter Details			
Name	Designation	Mobile No.	Email Id
Sourav Karmakar	Asst. Professor	9903527087	sourav.kkr91@gmail.com

Chapter 5: Non-Conventional Energy Source

MCQ Type: 1 mark

1. Which of the following is a non-renewable resource?

- (a) Coal
- (b) Forests
- (c) Water
- (d) Wildlife

2. Which among the following is not a renewable source of energy?

- (a) Solar energy
- (b) Biomass energy
- (c) Hydro-power
- (d) Geothermal energy

3. Identify the non-renewable energy resource from the following:

- (a) Coal
- (b) Fuel cells
- (c) Wind power
- (d) Wave power

4. Which of the following is a disadvantage of most of the renewable energy sources?

- (a) Highly polluting
- (b) High waste disposal cost
- (c) Unreliable supply

(d) High running cost

5. Photovoltaic energy is the conversion of sunlight into:

(a) Chemical energy

(b) Biogas

(c) Electricity

(d) Geothermal energy

6. Horizontal axis and vertical axis are the types of:

(a) Nuclear reactor

(b) Wind mills

(c) Biogas reactor

(d) Solar cell

7. Which among the following is not an adverse environmental impact of tidal power generation?

(a) Interference with spawning and migration of fish

(b) Pollution and health hazard in the estuary due to blockage of flow of polluted water into the sea

(c) Navigational hazard

(d) None of the above

8. Steam reforming is currently the least expensive method of producing:

(a) Coal

(b) Biogas

(c) Hydrogen

(d) Natural gas

9. A fuel cell, in order to produce electricity, burns:

(a) Helium

(b) Nitrogen

(c) Hydrogen

(d) None of the above

10. Fuel cells are:

(a) Carbon cell

(b) Hydrogen battery

(c) Nuclear cell

(d) Chromium cell

11. Both power and manure is provided by:

(a) Nuclear plants

(b) Thermal plants

(c) Biogas plants

(d) Hydroelectric plant

12. The outermost layer of the earth is:

(a) Magma

(b) Mantle

(c) Crust

(d) Solid iron core

13. Common energy source in Indian villages is:

(a) Electricity

(b) Coal

(c) Sun

(d) Wood and animal dung

14. The one thing that is common to all fossil fuels is that they:

(a) Were originally formed in marine environment

(b) Contain carbon

(c) Have undergone the same set of geological processes during their formation

(d) Represent the remains of one living organisms

15. The process that converts solid coal into liquid hydrocarbon fuel is called:

(a) Liquefaction

(b) Carbonation

(c) Catalytic conversion

(d) Cracking

16. Lignite, bituminous and anthracite are different ranks of:

- (a) Nuclear fuel
- (b) Coal
- (c) Natural gas
- (d) Biogas

17. Crude oil is:

- (a) Colourless
- (b) Odourless
- (c) Smelly yellow to black liquid
- (d) Odourless yellow to black liquid

18. BTU is measurement of:

- (a) Volume
- (b) Area
- (c) Heat content
- (d) Temperature

19. The first controlled fission of an atom was carried out in Germany in:

- (a) 1920
- (b) 1928
- (c) 1925
- (d) 1938

20. Boiling water reactor and pressurised water reactors are:

- (a) Nuclear reactor
- (b) Solar reactor
- (c) OTEC
- (d) Biogas reactor

21. Energy from gravitational field is energy obtained from

- (a) wind
- (b) biomass

(c) coal

(d) tides

22. Tidal pull of moon can distort continents pulling up and down up to

(a) 25 cm

(b) 30 cm

(c) 35 cm

(d) 40 cm

23. Gain in kinetic energy is equal to

(a) loss in P.E – work against friction

(b) loss in K.E – work against friction

(c) loss in P.E + work against friction

(d) loss in P.E × work against friction

Short Answer Type: 2 marks

1. What is Photo voltaic effect?

2. Write a short notes on MHD –generator?

3. Write a short note on Fuel cell?

4. List the non –conventional energy sources?

5. Write the advantages of non –conventional Energy sources?

6. Write the characteristics of wind energy?

7. What are the types of wind mills?

8. Write the types of wind machines?

9. Write the classification of Tidal power plants?

10. Write the applications of fuel cell?

11. Write the advantages of OTEC?

12. Define Tidal power plant?

13. Define Renewable sources of energy?

14. Define –Non-renewable source of energy?

15. Define Tidal power plant?

Subjective Type: 3 marks

1. What are the advantages and limitation of Tidal power generation?
2. Write the advantages of MHD systems?
3. Write the advantages and disadvantages of fuel cell?
4. Write the advantages of OTEC?
5. What are the five general categories of geothermal sources?
6. Write the application of geothermal energy?
7. What are the advantages and disadvantages of Geothermal Energy over other Energy forms?
8. How biogas can be produced?

Broad Type: 5 marks

1. Explain environmental impact of Tidal Power Plant
2. Briefly explain different constraints in the use of renewable energy sources.
3. What is maximum efficiency of conversion of wind system? Discuss its principle of conversion.
4. What are the reasons of Tides and how can they be used for power generation?
5. Explain equivalent circuit for solar PV panel.
6. What are the different factors considered for selection of Biogas Plant site?
7. Discuss applications and mechanism of generation of Biogas.

Question Paper Details					
Course	Stream	Semester	Subject	Paper Code	Chapter
B.Tech	EE	8	Energy Management and Audit	EE-801C	6

Paper Setter Details			
Name	Designation	Mobile No.	Email Id
Sourav Karmakar	Asst. Professor	9903527087	sourav.kkr91@gmail.com

Chapter 6: Energy Efficient Technologies in Electrical Systems

MCQ Type: 1 mark

- Maximum demand controller is used to _____.
 - Switch off essential loads in a logical sequence
 - Exceed the demand of the plant
 - Switch off non-essential loads in a logical sequence
 - Controls the power factor of the plant
- Capacitors with automatic power factor controller when installed in a plant:
 - Reduces active power drawn from grid
 - Reduces the reactive power drawn from grid
 - Reduces the voltage of the plant
 - Increases the load current of the plant
- _____ controls the power factor of the installation by giving signals to switch on or off power factor correction capacitors.
 - KVAR
 - Automatic power factor control relay
 - Intelligent power factor controller
 - Maximum demand controller
- _____ determines the rating of capacitance connected in each step during the first hour of its operation and stores them in memory.
 - Maximum demand controller
 - Intelligent power factor controller
 - Automatic power factor controller
 - KVAR

5. The following function cannot be achieved with automatic power factor controllers.

- a) Voltage control
- b) KILOVAR control
- c) kW control
- d) PF control

6. The following features apply to energy efficient motors by design:

- a) Energy efficient motors last longer
- b) Starting torque for efficient motors may be lower than for standard motors

State whether the two statements are True or False?

7. Eddy current drive can be a retrofit for _____.

- a) Constant speed system requirement
- b) Variable speed system requirement
- c) Dual speed system requirement only
- d) None of the above

8. Electronic variable frequency drive (VFD) connected to motors:

- a) Provide variable speed with high efficiency
- b) induces eddy-current in the secondary member of the clutch mechanism
- c) is not suitable for variable torque load
- d) Does not provide variable speed and has low-efficiency

9. Variable speed cannot be obtained with _____.

- a) DC motors controller
- b) AC motor controller
- c) Soft starter controller
- d) AC & DC controllers

10. Energy savings potential of variable torque applications compared to constant torque application is:

- a) Higher
- b) Lower
- c) Equal
- d) None of the above

11. As an energy efficient application, slip power recovery system fits well for _____.

a) Squirrel cage and slip ring motors

b) DC motor

c) Slip ring motors only

d) None of the above

12. Energy efficient transformer core is made up of _____.

a) Silicon alloyed iron (grain oriented)

b) Copper

c) Amorphous core - metallic glass alloy

d) none of the above

13. The basic functions of electronic ballast exclude one of the following:

a) to ignite the lamp

b) to stabilize the gas discharge

c) to reduce lumen output of the lamp

d) to supply power to the lamp

14. Select the application of fluid coupling fitting from the following:

a) acts as a voltage limiter

b) enables no-load start-up of prime-mover

c) works on the principle of eddy current

d) none of the above

15. The characteristic of conventional ballast in lighting application is one among the following:

a) They have low operational losses than electronic ballasts.

b) They have tuned circuit to deliver power at 25 Hz

c) They do not require a mechanical switch (starter)

d) They have high operational losses and high temperature rise

16. Application of occupancy sensors is well suited for ____.

a) day light based controllers

b) night based controllers

c) motor controllers

d) movement or noise detector in room space

17. Find the odd retrofit group from the following:

a) Occupancy sensors

- b) timer based control
- c) photo-sensors
- d) capacitor based control

18. Application of timers as a retrofit will assist in saving energy in areas of ____.

- a) Lighting & motors
- b) Transformers
- c) HV- Feeder Panels
- d) All the above

19. Electronic soft starters are used for motors to:

- a) achieve variable speed
- b) provide smooth start and stop
- c) improve the loading
- c) none of the above

20. Energy efficient lighting can be planned by using the following retrofits. – State True or False

- a) photo-sensor
- b) timer
- c) occupancy sensor
- d) localized switching

Short Answer Type: 2 marks

1. Briefly explain the benefits of employing a demand controller
2. What is APFC? What are its advantages?
3. Name watt loss areas for improvement by using energy efficient motors?
4. What are the technical aspects of energy efficient motors?
5. Write brief notes on soft-starters.
6. Briefly explain the advantages of electronic soft-starters?
7. List the applications of variable frequency drive control for motors operating on pumps and fans.
8. At least name two applications each for “Photo-sensors” and “Timer-controls”?

Subjective Type: 3 marks

1. Explain the affinity laws concerning variable torque loads.
2. Briefly describe the principle of variable frequency drive
3. What are the means of varying speeds of induction motor?
4. Explain the principle of Eddy current drive mechanism for motors.
5. Explain slip power recovery system as a speed control mechanism of motors?
6. Name any 4 retrofit actions at a facility having more than 100 standard efficiency motors in operation?
7. Indicate where this retrofit can play a role in an industrial facility.
8. Write a brief note on energy efficient transformers?
9. Briefly explain the functions of electronic ballast.
10. List various energy efficient lighting controls.

Broad Type: 5 marks

1. Explain the functions and benefits of a demand controller.
2. Explain at least two automatic power factor control methods?
3. List any 5 different types of energy efficient retrofits? Explain their application and benefits in 2-3 lines each.
4. Why variable torque loads offer greatest energy savings? Explain electronic methods of speed controllers?
5. Write short notes on Energy Efficient Lighting Controls.