

**NATIONAL CERTIFICATION EXAMINATION 2004  
FOR  
ENERGY MANAGERS**

**PAPER – EM1: GENERAL ASPECTS OF ENERGY MANAGEMENT & ENERGY AUDIT**

**Date: 22.05.2004 Timings: 0930-1230 HRS Duration: 3 HRS Max. Marks: 150**

**General instructions:**

- Please check that this question paper contains **6** printed pages
- Please check that this question paper contains **65** questions
- The question paper is divided into three sections
- All questions in all three sections are compulsory
- All parts of a question should be answered at one place

**Section – I: OBJECTIVE TYPE**

**Marks: 50 x 1 = 50**

- (i) Answer all **50** questions
- (ii) Each question carries **one** mark
- (iii) Put a (✓) tick mark in the appropriate box in the answer book

1.	Among the world's coal producers, India's position is a) 10th                      b) 17th                      c) 4th                      d) 26th
2.	The major commercial energy consuming sector in the country is a) Industry                      b) Agriculture                      c) Residential                      d) Transport
3.	Which energy is not a commercial energy a) electricity                      b) lignite                      c) oil                      d) solar hot water
4.	The annual current oil import bill of India is around Rs.... a) 8,000 crores                      b) 80,000 crores                      c) 800,000 crores                      d) 20,000 crores
5.	India's total installed power plant capacity requirement in MW in 2012 is estimated as a) 107,236 MW                      b) 150,804 MW                      c) 215,804 MW                      d) 300,000 MW
6.	A person can do the following with electricity a) destroy it                      b) create it                      c) burn it                      d) convert it
7.	Select the source of stored chemical energy a) electricity                      b) water                      c) coal                      d) compressed air
8.	The quantity of heat required to raise the temperature of 1 kg of a substance by 1° C is known as a) sensible heat                      b) specific heat                      c) latent heat                      d) calorific value

## Paper EM1 – Energy Manager – Set A

9.	A three phase induction motor is drawing 12 Ampere at 440 Volts. If the operating power factor of the motor is 0.85, then the power drawn by the motor is a) 7.8 kW                      b) 4.5 kW                      c) 5.3 kW                      d) 23.4 kW
10.	The term missing in the following equation $(kVA)^2 = (kW)^2 + ( ? )^2$ is a) cos phi                      b) sin phi                      c) kVAr                      d) kVArh
11.	Electrical resistance is defined as a) Current/Voltage                      b) Voltage/Current c) Voltage x Current                      d) Ohm x Voltage
12.	Energy management involves a) combination of technical and managerial skills                      b) managerial skills c) technical skills                      d) energy audit skills
13.	Air velocity in ducts is measured by a) stroboscope                      b) pitot tube                      c) lux meter                      d) fyrite
14.	An energy audit team is formed during a) post audit phase                      b) audit phase c) pre-audit phase                      d) the time of study
15.	Having an energy policy... a) shows top management commitment                      b) satisfying regulations c) indicates energy audit skills                      d) adds to the list of other policies
16.	Matching energy usage to requirement means providing a) just theoretical energy needed                      b) just the design needs c) energy with minimum losses                      d) less than what is needed
17.	A mass balance for energy conservation does consider the following substance a) steam                      b) water                      c) raw materials                      d) all of the above
18.	Diagrammatic representation of input and output energy streams of an equipment or system is know as a) mollier diagram                      b) sankey diagram c) psychrometric chart                      d) balance diagram
19.	Coal with 40% ash is fired in a boiler. The daily coal consumption is 80 tonnes. The ash going out of the boiler per day would be a) 32 tonnes                      b) 40 tonnes                      c) 48 tonnes                      d) 3.2 tonnes
20.	An oil fired boiler operates at an excess air of 15%. If the stoichiometric air to fuel ratio is 14 kg of air per kg of oil and oil consumption is 100 kg per hour, then the mass of flue gas liberated in kg/ hour would be a) 1320                      b) 1400                      c) 1190                      d) 1610
21.	An analysis which helps to bring into focus the positive and negative forces in an organisation is a) energy action planning                      b) force field analysis c) energy policy                      d) energy analysis
22.	Which of the following is the least important of a good energy information system a) data accuracy                      b) data relevance                      c) data volume                      d) data validation

## Paper EM1 – Energy Manager – Set A

23.	The first vital step in an energy management programme is a) measurements b) setting goals c) top management commitment d) energy audit
24.	A public expression of an organization's commitment of energy conservation is a) energy balance b) energy policy c) energy audit d) energy savings
25.	What is not the duty of an energy manager a) conduct an energy audit b) prepare an annual activity plan c) report to BEE and state level designated agency once a year d) prepare a scheme for efficient use of energy
26.	Based on the following Net Present Value, which of the projects seems to be the most attractive for investment a) - Rs 2123 b) Rs 0 c) + Rs 15 d) + Rs 1830
27.	A sensitivity analysis is an assessment of a) cash flows b) risks due to assumptions c) capital investment d) best financing source
28.	The Return on Investment, ROI, is expressed as a) (first cost/first year benefits) x100 b) NPV/ IRR c) annual costs/capital cost d) (annual net cash flow/capital cost) x100
29.	Cost of a heat exchanger is Rs. 1.0 lakh. The simple payback period (SPP) in years considering annual savings of Rs 60,000 and annual operating cost of Rs 15,000 is a) 0.75 b) 2.22 c) 1.66 d) 6.6
30.	A sum of Rs 100,000 is deposited in a bank at the beginning of a year. The bank pays 6% interest annually. How much money, in Rs., is in the bank account at the end of the fifth year, if no money is withdrawn? a) 126,247 b) 133,823 c) 130,000 d) 109,368
31.	A contract in which the costs are paid from all or part of the energy cost savings is called a) performance contract b) traditional contract c) extended technical guarantee contract d) guaranteed savings performance contract
32.	The following is not a step in PERT planning a) estimate one time required for each activity b) determine the critical path c) construct a network diagram d) identify activities and milestones
33.	The monthly electricity bill for a plant is Rs 10 lakhs which accounts for 38% of the total monthly energy bill. How high is the plant's monthly energy bill a) Rs 315.73 lakhs b) Rs 26.32 lakhs c) Rs 38 lakhs d) Rs 380 lakhs
34.	In Project Management, the critical path in the network is a) the quickest path b) the shortest path c) the path from start to finish d) the path where no activities have slack
35.	CPM in project management refers to a) critical periodic management b) critical project monitoring c) critical path method d) cost project management

## Paper EM1 – Energy Manager – Set A

36.	The simplest technique for scheduling of tasks and tracking progress is a) CPM                      b) Gantt chart                      c) PERT                      d) CumSum
37.	The Calorific Value of coal is 4000 kCal/ kg. Find out the oil equivalent of 100 kg of coal if the Calorific Value of oil is 10,000 kCal/ kg a) 100 kg                      b) 250 kg                      c) 40 kg                      d) 25 kg
38.	The ratio of energy consumption to corresponding production is called a) energy intensity                      b) specific energy consumption c) production energy ratio                      d) specific production ratio
39.	Energy consumed for the period is a) fixed consumption + variable consumption X production b) fixed consumption X production c) variable consumption X production d) (fixed consumption + variable consumption) X production
40.	The fixed energy consumption of a company is 1000 kWh per month. The line slope of the energy(y) versus production(x) chart is 0.3. The energy consumed in kWh per month for a production level of 80,000 tons/month is a) 25,000                      b) 24,000                      c) 24,100                      d) 38,000
41.	Fixed energy consumption can be determined from a a) bar chart                      b) vertical line chart                      c) pie chart                      d) X Y coordinate system
42.	In a cumulative sum chart, if the graph is going up, it means a) energy consumption is increasing                      b) energy consumption is reducing c) specific energy consumption is increasing                      d) nothing can be said
43.	In the first two months the cumulative sum is 8 and 16 respectively. In the next two months calculated energy consumption is more than actual energy consumption by 8 for each month. This means the energy savings at the end of the fourth month would be a) 24                      b) 32                      c) – 8                      d) 0
44.	In an industry the energy consumed for a period is 2.3 lakh kWh. The production in this period is 20,000 tonnes with a specific energy consumption of 10 kWh/ tonne. The fixed energy consumption of the plant is a) 30,000                      b) 23,000                      c) 7,000                      d) 10,000
45.	Which of the following is not part of energy monitoring a) data recording                      b) data analysis c) data reporting                      d) energy efficiency equipment financing
46.	The ozone layer exists in a) stratosphere                      b) troposphere                      c) atmosphere                      d) at sea level
47.	Global warming is mostly caused by emission of a) Sulphur Dioxide                      b) Carbon Monoxide c) Carbon Dioxide                      d) Methane
48.	Which is not a Greenhouse gas a) Methane                      b) Nitrous Oxide                      c) Carbon Dioxide                      d) Sulphur Dioxide

## Paper EM1 – Energy Manager – Set A

49.	The process under the Kyoto Protocol by which industrialized countries may invest into or buy certified emission reductions is called. a) cleaner development mechanism                      b) clean development mechanism c) prototype carbon trading                                d) none of the above
50.	Which of the following gas damages the ozone layer a) CFC's                      b) CO <sub>2</sub> c) Nitrogen                      d) Argon

----- **End of Section - I** -----

### Section - II: SHORT DESCRIPTIVE QUESTIONS

**Marks: 10 x 5 = 50**

- (i) Answer all **Ten** questions
- (ii) Each question carries **Five** marks

- S-1 What do you understand by the term Reserve to Production ratio (R/P) in the field of exploration of fossil fuels?
- S-2 What is energy intensity and what does it indicate?
- S-3 The energy consumed by a plant was 18,000 kWh over a day. The maximum load recorded during this time was 1000 kW. Calculate the load factor on that day.
- S-4 How is the Calorific Value of fuel measured in a laboratory?
- S-5 What is the significance of an energy policy and what general aims and specific targets does it relate to?
- S-6 Explain how matching energy use to actual requirements can enhance energy efficiency, and state one example with solution.
- S-7 Describe important features of a Sankey diagram.
- S-8 In a heat exchanger, steam is used to heat 40 kg/ hour of furnace oil from 30° C to 90° C. The specific heat of furnace oil is 0.22 kcal/kg °C. The latent heat of steam is 540 kcal/ kg. How much steam per hour is needed?
- S-9 Explain the objective of a force field analysis and how such an analysis is structured.
- S-10 On an energy efficiency investment of Rs 30,000/- the annual savings are Rs. 85,000/- and annual operating costs are Rs. 10,000/-. Calculate the simple pay back period (SPP) for the investment.

----- **End of Section - II** -----

# Paper EM1 – Energy Manager – Set A

## Section - III: LONG DESCRIPTIVE QUESTIONS

Marks: 5 x 10 = 50

- (i) Answer all **Five** questions
- (ii) Each question carries **Ten** marks

- L-1 Discuss the difference between energy conservation and energy efficiency.
- L-2 A plant is using 4 tonnes/day of coal to generate steam. The calorific value of the coal is 4000 kcal/ kg. The cost of coal is Rs. 2,000/tonne. The plant substitutes coal with rice husks, as a boiler fuel, which has a calorific value of 3000 kcal/ kg and cost Rs. 700/tonne. Calculate the annual cost savings at 300 days of operation, assuming that the boiler efficiency decreases from 78% on coal to 72% on rice husks.
- L-3 In a pumping system the motor efficiency is 90% and pump efficiency is 80%. The pump discharge is throttled causing 20% loss; moreover 28% are lost through friction in pipe fittings. The motor draws 34 kW. Calculate the net water power available at the end of the piping system.
- L-4 An investment of Rs 1.0 Lakh is made for a variable speed drive at the beginning of the year, which is also the date of first operation. Savings expected over 4 years are Rs. 30,000, Rs. 30,000, Rs. 40,000 and Rs. 45,000 respectively. Find out the Net Present Value at the end of the 4<sup>th</sup> year, if the discount rate is 12%.
- L-5 Construct a CPM diagram for the example below

Activity	Precedent	Time, weeks
A	Start	3
B	Start	4
C	A	1
D	A	2
E	B	2
F	C	3
Finish	F,E,D	-

----- **End of Section - III** -----