

**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.	World oil known reserves are presently estimated to last for another a) 65 years      b) 45 years      c) 90 years      d) 25 years
2.	The major commercial energy consuming sector in the country is a) Transport      b) Agriculture      c) Industry      d) Residential
3.	A three phase induction motor is drawing 7.8 kW at 440 Volts. If the operating power factor of the motor is 0.85, then the current drawn by the motor is a) 12 A      b) 10 A      c) 7.8 A      d) 15 A
4.	The country that accounts for nearly 25% of world commercial energy consumption is a) China      b) India      c) USA      d) Russia
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.	Wind energy may be a) burned      b) created      c) destroyed      d) converted
7.	Select the source of stored mechanical energy a) electricity      b) water      c) coal      d) compressed air
8.	The quantity of heat required to convert one kg of a solid into a liquid without change of temperature is called a) sensible heat      b) specific heat      c) latent heat of fusion      d) heat capacity



## Paper EM1 – Energy Manager – Set B

23.	The first vital step in an energy management programme is a) measurements c) top management commitment	b) setting goals 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.	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	
26.	An investment of Rs 96,000 has a simple payback period of two years. The monthly savings must be a) Rs 8,000    b) Rs 4,000    c) Rs 9,600    d) Rs 12,000	
27.	For an investment which has fluctuating annual savings over its project life, which of the following financial analysis techniques is the best? a) Simple payback period    b) ROI    c) NPV    d) IRR	
28.	ESCO stands for a) Energy supply company    b) Energy service company c) Energy standards company    d) Energy sourcing company	
29.	Cost of a high efficiency fan is Rs. 2.1 lakhs. The simple payback period (SPP) in years considering annual savings of Rs 75,000 and annual maintenance cost of Rs 5,000 is a) 2.8    b) 3.0    c) 2.6    d) 2.4	
30.	A sum of Rs 50,000 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) 63,245    b) 63,123    c) 66,911    d) 65,000	
31.	The ozone layer exists in a) stratosphere    b) troposphere    c) atmosphere    d) at sea level	
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 5 lakhs which accounts for 24% of the total monthly energy bill. How high is the plant's monthly energy bill a) Rs 6.58 lakhs    b) Rs 16.57 lakhs    c) Rs 20.83 lakhs    d) Rs 13.16 lakhs	
34.	The first step in a project development cycle is a) identify project components    b) implement the project c) arrange for financing    d) start training	
35.	Fixed energy consumption can be determined from a a) bar chart    b) vertical line chart    c) pie chart    d) X Y coordinate system	

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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 3,200 kCal/ kg. Find out the oil equivalent of 200 kg of coal if the Calorific Value of oil is 10,000 kCal/ kg a) 32 kg                      b) 96 kg                      c) 64 kg                      d) 128 kg
38.	The ratio of energy consumption to corresponding production is called a) production energy ratio                      b) specific production ratio c) energy intensity                      d) specific energy consumption
39.	Energy consumed for the period is described by the following equation a) $C + M \times \text{production}$ b) $C \times M + \text{production}$ c) $(C + M) \times \text{production}$ d) None of the above
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 0.2. The energy consumed in kWh per month for a production level of 80,000 tons/month is a) 18,000                      b) 16,000                      c) 17,000                      d) 80,200
41.	CPM in project management refers to a) critical periodic management                      b) critical path method c) cost project management                      d) critical project monitoring
42.	What is not a duty of an energy manager? a) report to BEE or State level designated agency b) provide support to accredited energy auditor firm c) sign an energy policy d) prepare a scheme for efficient use of energy
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 1.3 lakhs kWh. The production in this period is 10,000 tonnes with a specific energy consumption of 8 kWh/ tonne. The fixed energy consumption of the plant is a) 30,000                      b) 50,000                      c) 80,000                      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 efficient equipment financing
46.	A contract in which the costs are paid from all or part of the energy cost savings is called a) performance contract                      b) guaranteed savings performance contract c) traditional contract                      d) extended technical guarantee contract
47.	Global warming is mostly caused by emission of a) Carbon Dioxide                      b) Sulphur Dioxide                      c) Carbon Monoxide                      d) Methane

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48.	Which is not a Greenhouse gas a) Methane            b) Nitrous Oxide            c) Carbon Dioxide            d) Sulphur Dioxide
49.	Which of the following is not an environmental issue of global significance a) Ozone layer depletion            b) global warming            c) loss of biodiversity d) suspended particle matter
50.	The Prototype Carbon Fund has been established by a) United Nations            b) United States            c) World Bank            d) Japan

----- **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 Explain the difference between Gross Calorific Value (GCV) and Net Calorific Value (NCV) of a fuel.
- S-2 What are the limitations of a simple pay back period (SPP)?
- S-3 The energy consumed by a plant was 24,000 kWh over a day. The maximum load recorded during this time was 1400 kW. Calculate the load factor on that day.
- S-4 List four important factors involved in deciding final cost of purchased electricity.
- S-5 What do you mean by energy audit?
- S-6 What is reactive power and active power?
- S-7 Explain the meaning of fuel substitution and energy substitution with two examples each.
- S-8 In a heat exchanger, steam is used to heat 30 kg/ hour of furnace oil from 35° C to 85° C. The specific heat of furnace oil is 0.24 kcal/kg °C. The latent heat of steam is 540 kcal/ kg. How much steam per hour is needed?
- S-9 Explain what is meant by Greenhouse effect.
- S-10 Calculate the future value of a cash flow with NPV = Rs 1 Lakh at the end of the 7<sup>th</sup> year if the interest rate is 5%.

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

## Paper EM1 – Energy Manager – Set B

### Section - III: LONG DESCRIPTIVE QUESTIONS

Marks: 5 x 10 = 50

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

- L-1 Explain the difference between energy conservation and energy efficiency.
- L-2 A plant is using 5 tonnes/day of coal to generate steam. The calorific value of the coal is 3200 kcal/ kg. The cost of coal is Rs. 2,200/tonne. The plant substitutes coal with rice husks, as a boiler fuel, which has a calorific value of 3000 kcal/ kg and cost Rs. 900/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 95% and pump efficiency is 70%. The pump discharge is throttled causing 15% loss; moreover 24% are lost through friction in pipe fittings. The motor draws 42 kW. Calculate the net water power available at the end of the piping system.
- L-4 An investment of Rs 1.5 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. 40,000, Rs. 45,000, Rs. 50,000 and Rs. 55,000 respectively. Find out the Net Present Value at the end of the 4<sup>th</sup> year, if the discount rate is 16%.
- L-5 Construct a CPM diagram for the example below

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

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