Total No. of Questions : 12]

SEAT No. :

P1695

[Total No. of Pages : 5

[4859]-35

B.E. (Mechanical)

ENERGY AUDIT AND MANAGEMENT

(Elective - I) (2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer any three questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of Logarithmic tables, slide rule, electronic pocket calculator is allowed.***
6) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) Write short note on: **[10]**

i) Principles of energy management.

ii) Energy and environment.

b) Explain current energy consumption pattern in global and Indian industry. **[8]**

OR

Q2) a) Write short notes on: **[10]**

i) Energy security and reliability

ii) Need of Renewable and energy efficiency

b) Discuss different aspects of Energy Policy and strategy in energy Conservation Systems. **[8]**

Q3) a) Write short note on: **[8]**

i) Types of energy audit

ii) Energy Audit software

b) List the various equipments required for energy audit purpose. Explain the following instruments used for energy audit with their applications. **[8]**

i) Pitot tube

ii) Ultrasonic flow meter

OR

P.T.O.

Q4) a) Explain the aim of energy audit. Accurate measurement is very important in energy audit. Why? **[8]**

b) Describe Energy conservation opportunities in boiler and Steam system. **[8]**

Q5) a) Explain following financial analysis methods. **[8]**

i) Return on Investment

ii) Simple payback period

b) Calculate Net Present Value (NPV) of a project at a discount rate of 12% with an investment of Rs. 60,000 at the beginning of the first year, & saving of Rs. 28,000 & Rs. 41,000 at the end of the first & second year respectively. **[8]**

OR

Q6) a) How you will determine cost of electricity generated in case of steam power plant? **[8]**

b) A sum of Rs. 40,000 is deposited in a bank at the beginning of a year. The bank pays 8% interest annually. How much money is in the bank Account at the end of the fifth year, if no money withdraw? **[8]**

SECTION - II

Q7) a) Explain Condensate and flash steam recovery system. **[8]**

b) A brewery chilling system, ethylene glycol is used a secondary refrigerant. The designed capacity is 40 TR. A test was conducted to find out the operating capacity and energy performance ratios. The flow was measured by switching off the secondary pump and measuring the tank level difference in hot well. **[8]**

Measured data:

Temperature of ethylene glycol entering evaporator = (–) 1 °C

Temperature of ethylene glycol leaving evaporator = (–) 4 °C

Ethylene glycol flow rate = 13200 kg/hr

Evaporator ethylene glycol pressure drop (inlet to outlet) = 0.7 kg/cm^2

Power input to compressor electrical power kW = 39.5 kw

Specific heat capacity of ethylene glycol = 2.34 kcal/kg °C

OR

Q8) a) What are the measures to be taken for efficient operation of HVAC Systems. **[8]**

b) Explain in brief steam trap and why it is important in thermal power plant. **[8]**

Q9) a) The lighting connected load for the small industry consisting of 140 fluorescent tubes of 55 W each with magnetic ballast. In first option, the magnetic ballast of Fluorescent tubes is replaced by electronic ballast and power consumption of same fluorescent tubes reduces to 40W. Calculate the simple payback period of above replacement if cost of electronic ballast is Rs. 110. In second option, fluorescent tubes are replaced by energy efficient fluorescent tubes of 20W and cost of Rs. 450 each. Calculate simple payback period. Which energy saving option is bettter and why? Consider usage of 16 hours per day and an electrical tariff of Rs. 4 per kWh. **[10]**

b) What are the types of lamps used in lighting system? Write down their features with typical application. **[8]**

OR

Q10)a) Explain the following terms: **[10]**

i) Power Factor

ii) Maximum Demand

iii) Copper losses

iv) Stray losses

v) Luminous efficiency

b) What are different types of motor? Explain motor speed control system. **[8]**

Q11) a) What is the cogeneration? Describe technical option for cogeneration and write down advantage of cogeneration. **[8]**

b) Explain potential for waste-heat recovery in industry. **[8]**

OR

Q12) a) Explain in brief: **[8]**

i) CDM projects.

ii) Carbon credit calculation

b) Describe heat wheel used for waste heat recovery with neat sketch. **[8]**

10.0%

	Single Payment		Equal Payment Series				Gradient Series		
N	Compound Amount Factor (F/P,I,N)	Present Worth Factor (P/F,I,N)	Compound Amount Factor (F/A,I,N)	Sinking Fund Factor (A/F,I,N)	Present Worth Factor (P/A,I,N)	Capital Recovery Factor (A/P,I,N)	Gradient Uniform Series (A/G,I,N)	Gradient Present Worth (P/G,I,N)	N
1	1.1000	0.9091	1.0000	1.0000	0.9091	1.1000	0.0000	0.0000	1
2	1.2100	0.8264	2.1000	0.4762	1.7355	0.5762	0.4762	0.8264	2
3	1.3310	0.7513	3.3100	0.3021	2.4869	0.4021	0.9366	2.3291	3
4	1.4641	0.6830	4.6410	0.2155	3.1699	0.3155	1.3812	4.3781	4
5	1.6105	0.6209	6.1051	0.1638	3.7908	0.2638	1.8101	6.8618	5
6	1.7716	0.5645	7.7156	0.1296	4.3553	0.2296	2.2236	9.6842	6
7	1.9487	0.5132	9.4872	0.1054	4.8684	0.2054	2.6216	12.7631	7
8	2.1436	0.4665	11.4359	0.0874	5.3349	0.1874	3.0045	16.0287	8
9	2.3579	0.4241	13.5795	0.0736	5.7590	0.1736	3.3724	19.4215	9
10	2.5937	0.3855	15.9374	0.0627	6.1446	0.1627	3.7255	22.8913	10
11	2.8531	0.3505	18.5312	0.0540	6.4951	0.1540	4.0641	26.3963	11
12	3.1384	0.3186	21.3843	0.0468	6.8137	0.1468	4.3884	29.9012	12
13	3.4523	0.2897	24.5227	0.0408	7.1034	0.1408	4.6988	33.3772	13
14	3.7975	0.2633	27.9750	0.0357	7.3667	0.1357	4.9955	36.8005	14
15	4.1772	0.2394	31.7725	0.0315	7.6061	0.1315	5.2789	40.1520	15
16	4.5950	0.2176	35.9497	0.0278	7.8237	0.1278	5.5493	43.4164	16
17	5.0545	0.1978	40.5447	0.0247	8.0216	0.1247	5.8071	46.5819	17
18	5.5599	0.1799	45.5992	0.0219	8.2014	0.1219	6.0526	49.6395	18
19	6.1159	0.1635	51.1591	0.0195	8.3649	0.1195	6.2861	52.5827	19
20	6.7275	0.1486	57.2750	0.0175	8.5136	0.1175	6.5081	55.4069	20
21	7.4002	0.1351	64.0025	0.0156	8.6487	0.1156	6.7189	58.1095	21
22	8.1403	0.1228	71.4027	0.0140	8.7715	0.1140	6.9189	60.6893	22
23	8.9543	0.1117	79.5430	0.0126	8.8832	0.1126	7.1085	63.1462	23
24	9.8497	0.1015	88.4973	0.0113	8.9847	0.1113	7.2881	65.4813	24
25	10.8347	0.0923	98.3471	0.0102	9.0770	0.1102	7.4580	67.6964	25
26	11.9182	0.0839	109.1818	0.0092	9.1609	0.1092	7.6186	69.7940	26
27	13.1100	0.0763	121.0999	0.0083	9.2372	0.1083	7.7704	71.7773	27
28	14.4210	0.0693	134.2099	0.0075	9.3066	0.1075	7.9137	73.6495	28
29	15.8631	0.0630	148.6309	0.0067	9.3696	0.1067	8.0489	75.4146	29
30	17.4494	0.0573	164.4940	0.0061	9.4269	0.1061	8.1762	77.0766	30
31	19.1943	0.0521	181.9434	0.0055	9.4790	0.1055	8.2962	78.6395	31
32	21.1138	0.0474	201.1378	0.0050	9.5264	0.1050	8.4091	80.1078	32
33	23.2252	0.0431	222.2515	0.0045	9.5694	0.1045	8.5152	81.4856	33
34	25.5477	0.0391	245.4767	0.0041	9.6086	0.1041	8.6149	82.7773	34
35	28.1024	0.0356	271.0244	0.0037	9.6442	0.1037	8.7086	83.9872	35
40	45.2593	0.0221	442.5926	0.0023	9.7791	0.1023	9.0962	88.9525	40
45	72.8905	0.0137	718.9048	0.0014	9.8628	0.1014	9.3740	92.4544	45
50	117.3909	0.0085	1163.9085	0.0009	9.9148	0.1009	9.5704	94.8889	50
55	189.0591	0.0053	1880.5914	0.0005	9.9471	0.1005	9.7075	96.5619	55
60	304.4816	0.0033	3034.8164	0.0003	9.9672	0.1003	9.8023	97.7010	60
65	490.3707	0.0020	4893.7073	0.0002	9.9796	0.1002	9.8672	98.4705	65
70	789.7470	0.0013	7887.4696	0.0001	9.9873	0.1001	9.9113	98.9870	70
75	1271.8954	0.0008	12708.9537	0.0001	9.9921	0.1001	9.9410	99.3317	75
80	2048.4002	0.0005	20474.0021	0.0000	9.9951	0.1000	9.9609	99.5606	80
85	3298.9690	0.0003	32979.6903	0.0000	9.9970	0.1000	9.9742	99.7120	85
90	5313.0226	0.0002	53120.2261	0.0000	9.9981	0.1000	9.9831	99.8118	90
95	8556.6760	0.0001	85556.7605	0.0000	9.9988	0.1000	9.9889	99.8773	95
100	13780.6123	0.0001	137796.1234	0.0000	9.9993	0.1000	9.9927	99.9202	100