Name:

Enrolment No:

UPES
UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2019

Programme Name: M Tech Energy Systems | **Semester : II**
Course Name : Energy Audit | **Time : 03 hrs**
Course Code : EPEC-7029 | **Max. Marks : 100**
Nos. of page(s) : 3

SECTION A

S. No.	Question Body	Marks	CO
Q 1	List down the steps and outcomes of Pre-Audit Phase of Energy Audit.	4	CO1
Q 2	Describe the key elements of monitoring and targeting system.	4	CO2
Q 3	Describe the concept of fuel and energy substitution.	4	CO3
Q 4	List energy audit principles in line with ISO-50002 standard.	4	CO5
Q 5	Differentiate between energy performance indicators and benchmarking parameters.	4	CO3

SECTION B

Q 6	Explain in detail any DSM program run by BEE with its benefits.				10	CO4
Q 7	The cash flows in two different energy conservation projects are given in the table below. Help the management of an infrastructure company to decide which project to invest in as the management is interested in investing in only one project. The company is likely to consider any project which gives a minimum return on investment of 18%. Please justify your choice.				10	CO5
Q 8	The energy consumption pattern in a steel rolling mill over 8-month period is provided in the table below;				10	CO1, CO5

	Project A		Project B	
Investment	17,50,000/-		12,00,000/-	
Year	Expenses	Savings	Expenses	Savings
1		4,00,000		4,50,000
2		4,00,000		4,00,000
3		4,00,000		3,50,000
4		4,00,000		3,00,000
5	1,00,000	6,00,000		2,50,000
6		6,00,000		2,00,000
7		6,00,000		1,16,650
8		3,80,300		

Month	Production (Tons)	Coal Consumption

		(Tons)
1	488	422
2	553	412
3	455	411
4	325	363
5	488	438
6	585	426
7	455	414
8	419	396

Estimate

(i) Fixed energy consumption in the plant.

(ii) Expected coal consumption for a production of 600 tons/month.

Q 9 (a)	In pre-treatment process of a plating section of an engineering industry, LPG was being used indirectly to heat 6000 litres/hr of water by 10^0C. The industry is planning to convert from LPG to electrical heating. **Other data:** **Annual operating hours = 3000 hours** **Efficiency of indirect heating with LPG = 85%** **Calorific value of LPG = 11000 kcal/kg,** **Landed cost of LPG = Rs.75/kg** **Cost of electricity = Rs.6/kwh.** 1) If LPG is replaced with electrical heating with an investment is Rs.1.5 lakhs, compute simple payback period. 2) Calculate the CO_2 emissions in both the cases. Consider emission factors for LPG as 3 tons of CO_2/Ton of LPG and Electricity as 0.81 tons of CO_2/MWh	**10**	**CO2, CO5**
	OR		
Q 9 (b)	The average monthly electricity consumption in an Aluminium producing unit is 12.35 lac kWh. The other energy sources used in the manufacturing process are Furnace oil (GCV-9660 kcal/Ltr) and HSD (GCV-9410 kcal/Ltr). If the annual fuel oil consumption is 5760 kL of Furnace oil (sp. gr. 0.92) and 720 kL of HSD (sp. gr. 0.88), determine if the unit qualifies as a Designated Consumer under the EC Act?	**10**	**CO2, CO5**
	SECTION-C		
Q10	i) The integrated paper plant has produced 119366 MT of paper during the year	**15**	**CO1 CO4**

	2012-13. The management has implemented various energy conservation measures as part of PAT scheme and reduced the specific energy consumption from 53 GJ/ tonne of product to 50 GJ/tonne of product. The actual production during the assessment year (2014-15) is 124141 MT. Calculate the plant energy performance and state your inference. ii) Explain PAT Scheme and its potential impact?	**5**	
Q11(a)	Explain the principle of ISO-50001 in detail, discuss the conditions based on which you can raise a nonconformity in the organization as a Lead Auditor with some examples.	**20**	**CO3, CO5**
	OR		
Q11(b)	Giving some relevant evidence explain in detail how you can identify the significant energy use in any organization. Discuss how the energy performance of any organization is evaluated giving some examples.	**20**	**CO3, CO5**

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SECTION A

S. No.	Question Body	Marks	CO
Q 1	List the categorization of various energy conservation options available in the industries based on financial aspects by the energy auditor.	**4**	**CO1**

Q 2	Describe the energy audit report format in brief.	**4**	**CO2**
Q 3	Define Energy Benchmarking and List down the key elements of Energy Monitoring and Targeting	**4**	**CO3**
Q 4	List the steps involved in PDCA cycle of Energy Management system for continuous improvement.	**4**	**CO4**
Q 5	List the information obtained after post audit phase.	**4**	**CO5**
	SECTION B		
Q 6	A company has got following two investment options: **Option A:** Investment envisaged Rs. 40 lakhs with an annual return of Rs. 8 lakhs; Life of the project is 10 years **Option B:** Investment envisaged Rs. 24 lakhs; Annual return Rs. 5 lakhs; Life of the project is 8 years Calculate IRR of both the options and suggest which option the company should select.	**10**	**CO5**
Q 7	An evaporator is to be fed with 10,000 kg/hr of a solution having 1 % solids. The feed is at 38^{o}C. It is to be concentrated to 2% solids. Steam is entering at a total enthalpy of 640 kCal/kg and the condensate leaves at 100^{o}C. Enthalpies of feed are 38.1 kcal/kg, product solution is 100.8 kCal/kg and that of the vapour is 640 kCal/kg. Find the mass of vapour formed per hour and the mass of steam used per hour.	**10**	**CO2**
Q 8	Discuss how DSM program can be formulated, list the requirement for devising any new DSM program.	**10**	**CO3**
Q 9 (a)	Explain the energy planning process in line with ISO-50001 in detail.	**10**	**CO1, CO4**
	OR		
Q 9 (b)	Explain in detail Energy Audit Planning in line with ISO-50002.	**10**	**CO1, CO4**
	SECTION-C		
Q10	i) Discuss the Bachat Lamp Yojna (BLY) in detail and explain how BLY was implemented in India listing the participating agencies and their roles. ii) Explain in detail how UDAY scheme and UJALA Scheme has supported in making Indian Economy strong.	**10** **10**	**CO1** **CO3**

Q11(a)	During the ISO-50001 audit of educational institute you have found out following (i) That even when the lecture is over students and faculty did not turn of the lights and fans of the classroom. When you as a Lead Auditor have informed the same to the energy manager of the institute he replied confidently that the responsibility of shutting down the electrical load is given to the guards and they shut down the lights and fans and manager gives no written or visual proof for the same. (ii) Education institute is still using the older technologies in some places with reduced efficiency since the institute was formulated (10 years). Looking above two points explain weather you will raise any non-conformity and justify your answer with suitable proofs and determine the potential impact on the auditee organization due to above incidents.	**20**	**CO3, CO5**
OR			
Q11(b)	Explain in detail how you can implement ISO-50001 in UPES, List down suitable documents and record which are required for the implementation.	**20**	**CO3, CO5**