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

Course: Energy Management and Audit   **Semester: II**
Program: Int. B. Tech. – ET+IPR   **Time 03 hrs.**
Course Code: ETEG 433   **Max. Marks: 100**

SECTION A

S. No.		Marks	CO
Q 1	What parameters are measured with the following instruments? a) Pitot tube b) Stroboscope c) Fyrite d) Psychrometer	**4**	**CO1**
Q 2	Based on energy audit and analyses of the plant, classify ENCON measures.	**4**	**CO4**
Q 3	Give any four bench marking parameters followed in equipment/utility related in Industries.	**4**	**CO3**
Q 4	List 4 designated consumers and their Energy Consumption in MTOE notified as designated consumers under the EC Act 2001.	**4**	**CO4**
Q 5	Explain the difference between Standards and Labeling.	**4**	**CO4**

SECTION B

Q 6	Briefly explain the essential elements of monitoring and targeting System.	**10**	**CO3**
Q 7	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**	**CO1**
Q 8	A manufacturing industry plans to improve its energy performance under PAT through implementation of an energy conservation scheme. After implementation, calculate the Plant Energy Performance (PEP) with 2015-16 as the reference year. What is your inference? Given that: The current year (2016-17) Annual Production – 28,750 T , Current year (2016-17) Annual Energy Consumption– 23,834 MWh, Reference year (2015-16) production - 34,000 T, Reference year (2015-16) Energy consumption - 27,200 MWh.	**10**	**CO3** **CO4**
Q 9	Explain Sankey diagram with an example.	**10**	**CO5**

SECTION-C

| Q 10 | Use CUSUM technique to develop a table and to calculate energy savings for 8 months period. For calculating total energy saving, average production can be taken as 6,000 MT per month. Refer to field data given in the table below. | 20 | CO3 CO5 |

Month	Actual SEC kWh/MT	Predicted SEC kWh/MT
May	1311	1335
June	1308	1335
July	1368	1335
August	1334	1335
September	1338	1335
October	1351	1335
November	1322	1335
December	1320	1335

Also draw CUSUM graph.

| Q 11 | Distinguish between 'preliminary energy audit' and 'detailed energy audit'.

OR

A plant is using 6 tons / day of coal to generate steam. The calorific of coal is 3300 kcal /kg. The cost of coal is Rs 4200/ton. The plant substitutes coal with agro-residue as a boiler fuel, which has a calorific value of 3100 kcal/kg and costs Rs 1800/ton. Calculate the annual cost savings at 300 days of operation, assuming the boiler efficiency remains same at 72% for coal and agro residue as fuel. | | CO1 CO2 |

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SECTION A

S. No.		Marks	CO
Q 1	List parameters to be measured by following instruments: a) Portable power analyser b) Combustion analyser	4	CO1
Q 2	How do you classify energy conservation measures?	4	CO4
Q 3	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?	4	CO3
Q 4	Name four energy intensive industries having annual energy consumption of 30,000 metric tonne of oil equivalent and above, notified as designated consumers under the EC Act 2001	4	CO4
Q 5	Write short notes on "Standards and Labeling".	4	CO4

SECTION B

Q 6	Briefly explain and give formula of Production factor, Reference year equivalent and Plant Energy Performance.	10	CO3 CO4
Q 7	In a textile plant monthly energy consumption is 7,00,000 kWh of electricity , 40 kL of furnace oil (specific gravity=0.92) for thermic fluid heater, 360 tonne of coal for steam boiler and 10 kL of HSD (specific gravity= 0.885) for material handling equipment. Compute the energy consumption in terms of Metric Tonne of Oil Equivalent (MTOE) for the plant. Given Data: (1 kWh = 860 kcal, GCV of coal= 3450 kCal/kg, GCV of furnace oil= 10,000 kcal/kg, GCV of HSD= 10,500 kcal/kg, GCV of rice husk= 3100 kcal/kg, 1 kg oil equivalent = 10,000 kcal)	10	CO1
Q 8	List down and explain the key elements of monitoring and targeting System.	10	CO3
Q 9	Draw and explain Sankey diagram for an Internal Combustion Engine.	10	CO5

SECTION-C

Q 10 Develop a table using a CUSUM technique to calculate energy savings for 8 months period for a production level of 2000 MT per month. Refer to field data given in the table below.

Month	Actual SEC kWh/MT	Predicted SEC kWh/MT
May	1225	1250
June	1227	1250
July	1240	1250
August	1245	1250
September	1238	1250
October	1257	1250
November	1248	1250
December	1264	1250

Estimate the savings accumulated from use of the heat recovery system.
Also draw CUSUM graph.

20 **CO3 CO5**

Q 11 Discuss a typical energy audit reporting format.

OR

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.
a) If LPG is replaced with electrical heating with an investment is Rs.1.5 lakhs, compute simple payback period.
b) 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

CO1 CO2