

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
END SEMESTER EXAMINATION, DECEMBER 2021

Course: Energy Audit
Program: M. Tech-Energy Systems
Course Code: EPEC-7029

Semester: III
Time 03 hrs.
Max. Marks: 100

SECTION A

(5Q x 4M = 20 Marks)

S. No.		CO
Q1	Highlight the essential elements of the monitoring and targeting system.	CO1
Q2	List any five benchmarking parameters followed for either equipment or industrial production.	CO2
Q3	In the process industry, 12,000 kg/hr water is currently being heated from 18°C to 80°C by indirect heating of steam. An opportunity has been identified which would preheat the inlet water to 45°C to reduce the steam required. Estimate the reduction in steam in kg/hr considering latent heat of steam as 520 kcal/kg in both cases.	CO3
Q4	List the parameters measured with the following instruments, a) Pitot tube b) Stroboscope c) Fyrite d) Psychrometer e) Anemometer	CO1
Q5	Differentiate between non-conformity, corrective measure and preventive measure as per ISO-50001 energy management system, standard.	CO2

SECTION B

(Scan and upload)

(4Qx10M = 40 Marks)

Q6	The integrated paper plant has produced 119366 MT of paper during the year 2017-18. The management has implemented various energy conservation measures as part of the 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 (2019-20) is 124141 MT. Calculate the plant energy performance and state your inference.	CO1																											
Q7	Explain the PDCA cycle of the ISO-50001 standard in detail and list some benefits of implementing ISO-50001 standards in industries.	CO2																											
Q8	Discuss in detail how DSM programs, PAT, ECBC and UJALA schemes assist in reducing the energy intensity from the Indian economy.	CO2																											
Q9	The energy consumption pattern in a steel re rolling mill over 8 month period is provided in the table below; <table border="1" data-bbox="386 1686 1243 1787"> <thead> <tr> <th>Month</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> </tr> </thead> <tbody> <tr> <td>Production (Tons)</td> <td>488</td> <td>553</td> <td>455</td> <td>325</td> <td>488</td> <td>585</td> <td>455</td> <td>419</td> </tr> <tr> <td>Coal consumption (Tons)</td> <td>422</td> <td>412</td> <td>411</td> <td>363</td> <td>438</td> <td>426</td> <td>414</td> <td>396</td> </tr> </tbody> </table> <p>Estimate, a) Fixed energy consumption in the mill. b) Expected coal consumption for a production of 600 tons/month</p>	Month	1	2	3	4	5	6	7	8	Production (Tons)	488	553	455	325	488	585	455	419	Coal consumption (Tons)	422	412	411	363	438	426	414	396	CO3
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Section C
(Scan and upload)

(2Qx 20M= 40 Marks)

Q10	<p>As per the ISO-50001 Energy Management System standard clause 4.4.5 regarding Energy performance indicators, it is required that –</p> <ul style="list-style-type: none"> • The organization shall identify EnPI's appropriate for monitoring and measuring energy performance. • The methodology for determining and updating the EnPI's shall be recorded and regularly reviewed. • EnPI's shall be reviewed and compared to the energy baseline regularly. <p>Based on the above clause answer the following</p> <p>a) Explain the meaning of the above clause in detail.</p> <p>b) Identify the benefits that an organisation can achieve after implementing this clause.</p> <p>c) Discuss the procedure to implement this clause in the organisation.</p>	CO2
Q11	<p>a) A Residential colony having a fixed load of 250 KVA is situated 1 km away from a 3-phase, 11kV/415 V transformer from which the power is to be fed. The management is evaluating the choice of LT (1 run x 3.5 core x 300sqmm) v/s HT (1 run x 3 core x 70sqmm) distribution for a 1 km stretch. Given the following data, as an energy auditor what would you suggest and estimate the payback period on marginal investment (difference in the two investments)</p> <p>b) Support your recommendation with calculations.</p> <p>c) Given Data</p> <ul style="list-style-type: none"> • The total Resistance of LT cable (conductor cross-section 300sqmm) is 0.13 ohms/km and the cost is Rs 700/m • Total Resistance of HT cable (conductor cross section 70sqmm) is 0.570 ohms / km and the cost is Rs 1300/ m • Unit price is Rs 7 / kWh • Cost of relocating the transformer (in case of HT cabling) = Rs 1 lakh • Add voltage regulations loss (single run * $\sqrt{3}$) <p style="text-align: center;">OR</p> <p>a) An energy audit of electricity bills of a process plant was conducted. The plant has a contract demand of 5000 kVA with the power supply company. The average maximum demand of the plant is 3850 kVA/month at a power factor of 0.95. The maximum demand is billed at the rate of Rs.600/kVA/month. The minimum billable maximum demand is 75% of the contract demand. An incentive of 0.5% reduction in energy charges component of the electricity bill is provided for every 0.01 increase in power factor over and above 0.95. The average energy charge component of the electricity bill per month for the plant is Rs.18 lakhs.</p> <p>The plant decides to improve the power factor to unity. Determine the power factor capacitor kVAr required, the annual reduction in maximum demand charges and the energy charge component. What will be the simple payback period if the cost of power factor capacitors is Rs.900/kVAr.</p>	CO3