Reg. No.



VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING) END SEMESTER EXAMINATIONS, DECEMBER 2020

ADVANCED ENERGY MANAGEMENT [ELE 4005]

REVISED CREDIT SYSTEM

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Time	e: 3 Hours Date: 30 December 2020	Max. Marks: 50
Instr	ructions to Candidates:	
	 Answer ALL the questions. Missing data may be suitably assumed 	
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1A.	Define the following terms with examples:	
	a) Tonne of oil equivalent.	
	b) Reserve production ratio	
	c) Specific energy consumption	(03)
1B.	A three phase 10 KW induction motor has the name plate 415V, 18.2 Amps and 0.9 power factor (PF). During motor power analyzer showed the following measurements:	details as operation,
	Voltage: 415V, Current: 12Amps, PF: 0.7.	
	What is the %age loading on the motor?	(02)
1C.	List the thrust areas of Energy Conservation Act 2001. Also how Bureau of Energy Efficiency (BEE) facilitates energy	highlight, efficiency
10	programs in mula:	(03)
1D.	An industry intends to invest Rs. 10,00,000 in a new ene project.	rgy saving
	The cash flows expected are:	
	Year 1: Rs.4,00,000; Year 2: Rs.5,00,000; Year 3: Rs.4,	00,000
	The rate of interest is 10%. Evaluate the Net Present	Value and
	comment on the leasibility of the project?	(02)
2A.	Describe the different phases of a detailed Energy Audit.	(03)
2B.	What is demand side management (DSM)? How is it different supply side management?	erent from (02)
2C.	During April-2020, a plant has recorded a maximum dema kVA and average PF was observed to be 0.82 lag, The average PF to be maintained is 0.92 lag as per the independ supplier and every one % dip in PF attracts a penalty of every month.	nd of 600 minimum dent utility Rs 20,000
	 a) Calculate the improvement in PF for May-2020 by ins KVAR capacitors. 	talling 100
	b) Calculate penalty to be paid if any during May-2020.	(02)

2D.	Two main areas of an industrial plant have the following lighting systems:	
	Area A: Fifty 400W High Pressure Sodium (HPSV) single lamp luminaires.	
	Area B: Thirty-five 400W Mercury Vapour (HPMV) single lamp luminaires.	
	In Area A and Area B, the measured illuminance during daylight hours (12 hours) without artificial light was found to be adequate. In Area B it was noted that eight of the HPMV fixtures are redundant. The plant operates for 8760 hours in a year and the per unit energy cost is Rs 5. Calculate the annual potential energy cost savings from switching off unnecessary lights and from disconnecting redundant luminaires?	(03)
3A.	What are the necessary steps to be taken for assessing energy performance?	(03)
3B.	A plant is using 6 ton/day of coal in a boiler to generate steam at 72% boiler efficiency. The calorific value of coal is 3300 kCal/kg. The cost of coal is Rs.4200/ton. To generate same amount of steam, 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. The boiler efficiency reduces to 68% with agro-residue as a fuel. Calculate the annual cost savings for 300 days of operation with agro residue as fuel.	
3C.	Explain the importance of market monitoring, verification and enforcement (MVE) activities taken up to accelerate adoption of energy-efficient products.	
3D.	A 500-kVA transformer is designed for no load loss of 750 watts and load loss of 5700 Watts. The calculated total transformer loss is 1662 watts. What will be the percentage loading of the transformer?	
	What is will be the transformer losses in watts at 50% loading?	(02)
4A.	What are the effects of Ozone Layer depletion?	
4B.	A refrigeration system designed with 10 TR Air Handling Unit (AHU) is operating at 8.25 TR. The measured air parameters are given below:	
	Inlet enthalpy = 10.26 kcal/kg Outlet enthalpy = 7.26 kcal/kg.	
	Specific volume of air = $0.83 \text{ m}^3/\text{kg}$. Calculate the volume of air in m ³ /hr handled by AHU.	(02)
4C.	A process plant has installed 4-cell cooling tower, with 45 kW cooling tower fans for each cell and operating at 40 kW at 1450 rpm. As a part of the energy conservation program, the existing fan motors are replaced with two speed motors which would operate at 1450 rpm and 740 rpm. The cooling towers are operated at high speed mode for 5300 hours and at low speed mode for 1800 hours, in a year.	
	Estimate the annual energy savings when compared to operation of fans continuously at a fixed speed of 1450 rpm.	(03)
4D.	Describe MODBUS serial architecture with the help of a neat sketch.	(02)

5A. Draw a neat Entity-Relationship (ER) model to represent the following scenario:

An electric supply company serves different types of customers. Customers are classified as Residential, Commercial and Industrial. Energy meters are installed in customer premises to record their energy consumption.

- **5B.** Identify the keys for the relational model representation of the ER model in **Q5A**.
- **5C.** An energy meter records the following electrical parameters for each customer represented in the ER model of **Q5A**:
 - 1. Voltage
 - 2. Current
 - 3. Power factor
 - 4. Frequency

The meter records this data at one-hour interval.

Write a Structured-Query-Language (SQL) statement to create a relational table(s) to store this data.

- **5D.** With reference to the relational table(s) created in **Q5C**, write SQL statements to:
 - 1) INSERT a record into the table(s).
 - 2) Display all the energy details of any one customer. (02)

(03)

(02)

(03)