Reg. No.



VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING) END SEMESTER EXAMINATIONS, NOVEMBER 2019

ADVANCED ENERGY MANAGEMENT [ELE 4005]

REVISED CREDIT SYSTEM

Time	: 3 Hou	urs Date: 26 November 2019	Max. Ma	rks: 50			
Instructions to Candidates:							
	↔ Ar	nswer ALL the questions.					
	••• M1	issing data may be suitably assumed.					
1A.	With t infrast	the help of a neat sketch explain the building blocks of Advanced cructure.	metering	(03)			
1B.	With t	he help of suitable example, differentiate between traditional and smart	metering.	(02)			
1C.	What a	are different levels of database abstraction, explain?		(02)			
1D.	Develo	op an Entity-Relationship (ER) model for the following requirement:		(03)			
	It is re includ connec condit classif for ea month (both o	quired to develop an Electricity bill payment system. The payment sys e customer details and their connections. One person can have more ction. For each connection, description of the type of loads (ligh ioners, Pumps), their electrical parameters will be recorded. Custome ied into residential, commercial and industrial. Monthly bill need to be g ch connection. The monthly bill must include total units consumed ly power factor, peak demand. Using the ER-model, calculation of lo daily and monthly) and diversity factor must be possible.	tem must than one nting, Air ers can be generated , average pad factor				
2A.	For the	e ER-model developed in Q1D, list the following:		(02)			
2B.	For the	nary keys b) Foreign keys c) Derived attributes d) Multivalued attributes d	ibutes. the	(03)			
	follow i. ii. iii.	ing: Display the names of the customers. Display the different electrical loads registered in the name of "M, Manipal". "M/s MAHE Manipal" is a commercial customer. Display the names of all residential customers who have registered " their city	/s MAHE, Udupi" as				
2C.	For the i. ii. iii.	e ER-model developed in Q1D, write SQL statements for the following: Insert a record into the customer table. The customer type is residenti Update the city="Manipal" for customer name "Mr. XYZ" Display the number of connections registered under the name of "M Manipal".	al. /s MAHE,	(03)			
2D.	Explai	n the properties required for a database transaction to happen.		(02)			

- **3A.** Highlight thrust areas of Energy conservation act 2001.
- **3B.** Differentiate between Energy Conservation and Energy Efficiency? Highlight the principles of energy management.
- **3C.** Energy consumption and production data were collected for a steel plant over a period **(03)** of 18 months. During month 9, a heat recovery system was installed. Using the plant monthly data, estimate if any savings is made in energy costs by installing heat recovery system. The plant data is given in Table 3C below:

IADLE 3U									
Month	1	2	3	4	5	6	7	8	9
Energy Consumed									
(kwh)	340	340	380	380	300	400	280	424	420
Production (Tonnes)	380	440	460	520	320	520	240	620	600
Month	10	11	12	13	14	15	16	17	18
Energy Consumed									
(kwh)	400	360	320	340	372	380	280	280	380
Production (Tonnes)	560	440	360	420	480	540	280	260	500

3D. During the summer a rooftop PV system generates 10 kWh/day during the off-peak hours and 10 kWh/day during the on-peak hours. Suppose, that the customer uses 2 kWh/day on-peak and 18 kWh/day off-peak.

INDEL 5D							
		June - Feb	Mar – May	(Summer)			
On Peak 7-10 am 5 - 8		5 - 8 pm	Rs 8/kwh	2-8 pm	Rs 20/kwh		
				All other			
Off Peak	f Peak All other times			times	Rs 9/kwh		

TARIE 2D

Find the net savings in electric bill for the summer months for this customer if the Time-Of-Use (TOU) rates of Table 3D apply. What would be the total monthly electric bill for the summer months if the customer opted for the following tariff structure instead of TOU rates?

First 700 units – Rs 8/kwh, 701-1000 units – Rs 15/kwh, Above 1001 units – Rs 20/kwh.

- **4A.** What is demand side management (DSM)? Compare DSM with supply side management. **(02)**
- **4B.** List out the different demand side management options.
- 4C. A tariff in force is Rs. 50 per kVA of maximum demand per year plus 10 paise per kWh. (03) A consumer has a maximum demand of 10 kW with a load factor of 60% and p.f. 0.8 lag. (i) Calculate saving in his annual bill if he improves power factor to 0.9 lag. (ii) Show the effect of improving load factor to 80% with the same max. demand and power factor 0.8 lag on the total cost per kWh.
- **4D.** A three phase, 50 Hz, 400V motor develops 74.6 KW at power factor of 0.75 lag and *(03)* efficiency of 93%. A capacitor bank is connected in delta across the supply terminals and power factor is improved to 0.95 lag. If each capacitance unit is built using 4 similar 100V capacitors, what is the capacitance of each capacitor.
- **5A.** What are the different demand side management (DSM) strategies possible using **(02)** lighting? What are the matters of concern when implementing DSM using lighting?
- **5B.** List the features of Zigbee that make it useful for implementing smart energy meters. **(02)**
- **5C.** List the different name plate parameters of an electric motor. Explain their importance **(03)** in understanding motor specifications.
- **5D.** With the help of neat sketches, explain how energy is saved with variable speed drive **(03)** method of flow control compared to throttling.

(03)

(02)

(02) (02)