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# MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

*(A constituent Institution of MAHE, Manipal )*

## VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

## MAKEUP EXAMINATIONS, DECEMBER 2018

## SUBJECT: ADVANCED ENERGY MANAGEMENT [ELE 4005]

REVISED CREDIT SYSTEM

**Time: 3 Hours** **Date: 31, December 2018** **Max. Marks: 50**

**Instructions to Candidates:**

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

**1A.** What does Advanced Metering Infrastructure (AMI) do? ***(02)***

**1B.** Explain the drawbacks of using a file based systems to store Energy Management System (EMS) data. ***(03)***

**1C.** Differentiate between Instance and Schema as related to RDBMS. ***(02)***

**1D.** Explain the roles of the different types of Database users. ***(03)***

**2A.** An electricity supply company requires to maintain consumption details of its customers. The following information are required on a monthly basis for making business decisions.

a. Number of existing consumers / new consumers add in the current month

b. Power consumption details of consumers

c. Generation of monthly bill for consumers.

Create a E-R model for this application with proper notations. The E-R model must include – Entities / Relationships – with attributes, Cardinalities, Constraints, Roles, Weak entities ***(04)***

**2B.** With reference to Q2A, write relational algebraic expressions to:

1. Find the total number of new consumers added in the month of October 2018.
2. Find the power consumption details of any given consumer in any given month of a year.
3. List the consumer names and their addresses. ***(03)***

**2C.** With reference to Q2A, write a SQL statement to:

1. Insert details of a new consumer
2. Update address details of a given consumer.
3. List the consumer names and their monthly bill amount for any given month. ***(03)***

**3A.** List the strategies for better energy security of the nation. ***(03)***

**3B.** The contract demand of plant is 1000 kVA. The minimum billing demand is 75% of the contract demand. The basic tariff structure is as follows:

Demand charges : Rs. 180 per kVA / month

Unit charges : Rs. 3.75 for the first one lakh units / month

Rs. 3.50 above one lakh units / month

Fuel surcharge : Rs. 0.20 per unit / month

Service Tax : Rs. 0.25 per unit / month

Meter rent : Rs 500 / month

The energy consumption is 3,15,000 units and the maximum demand recorded is 600 kVA. Calculate the cost of monthly electricity consumption? ***(03)***

**3C.** A three phase synchronous motor having a mechanical load (including losses) of 183KW is connected in parallel with a load of 765KW at 0.8 PF lagging. The excitation of the motor is adjusted so that the KVA input to the motor becomes 210KVA. Find the new power factor of the whole system. Represent the system before and after power factor improvement using power triangle. ***(04)***

**4A.** What is Installed load efficacy ratio (ILER)? Explain its role in energy management of lighting systems. ***(04)***

**4B.** Two main areas of an industrial plant have the following lighting systems:

Area A: 50 x 400W High Pressure Sodium (HPSV) single lamp luminaires.

Area B: 35 x 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 8 of the MV fixtures are redundant.

Plant Operating Hours: 24 hours per day, 365 days per year.

Electricity Energy costs: Rs 3.00/kWh

Calculate the annual potential energy cost savings from switching off unnecessary lights and from disconnecting redundant luminaires? ***(03)***

**4C.** Explain how two-part tariff helps to recover fixed and operating costs of power generation. ***(03)***

**5A.** Determine the load factor at which the cost of supplying a unit of electricity is same in Diesel station as in a steam station if the respective annual fixed cost and running costs are given below:

Diesel: Rs (40/KW+0.06/KWH) Steam : Rs (160/KW+0.015/KWH) ***(03)***

**5B.** Explain neat sketches and necessary equations, how economic load dispatch is achieved. ***(03)***

**5C.** With the help of neat sketch explain ZigBee protocol stack. ***(04)***