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MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOVEMBER 2017

SUBJECT: ADVANCED ENERGY MANAGEMENT [ELE 4005]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 28 November 2017** **Max. Marks: 50**

Instructions to Candidates:

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

1A. Explain the building blocks of advanced metering infrastructure. Compare conventional energy meter and smart energy meter with the help of a block diagrams. ***(04)***

1B. Explain the objectives of an Energy management system (EMS). ***(03)***

1C. Draw a neat labeled sketch depicting the EMS and SCADA functions. ***(03)***

2A. A power plant has three units with the following cost characteristics:

$C1=0.5(P1)^2+215(P1) + 5000$ Rs/hour, $C2=1.0(P2)^2+270(P1)+5000$ Rs/hour

$C3=0.7(P3)^2+160(P3) + 9000$ Rs/hour, where (Pi)s are the generating powers in MW. The maximum and minimum loads allowable on each unit are 150 and 39 MW. Find the economic scheduling for a total load of i) 320 MW ii) 200 MW ***(04)***

2B. What are the End-Use technology options in Demand side management (DSM)? ***(02)***

2C. Explain how performance of a lighting system is assessed. ***(04)***

3A. Compare individual pricing and group pricing, what are it implications on DSM? ***(03)***

3B. What is the need for Air-conditioning an interior? What are the methods by which air-conditioning load can be reduced? ***(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. With suitable examples explain the need for Relational Database management systems (RDBMS) in Energy management system (EMS). ***(03)***

4B. Draw a neat sketch of RDBMS architecture and label the parts. ***(03)***

4C. 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)***

5A. Illustrate with suitable examples the usage of the following relational operations in relational algebra:

SELECTION, PROJECTION, JOIN, DIVISION ***(04)***

5B. With reference to Q4C, write a relational algebraic expressions to :

1. Find the total number of new consumers added in the month of October 2017.
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)***

5C. With reference to Q4C, 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)***