MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

I SEMESTER M.TECH (ENERGY SYSTEMS & MANAGEMENT)

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: ADVANCED ENERGY MANAGEMENT [ELE 5103]
REVISED CREDIT SYSTEM

Time: 3 Hours   **Date: 26 November 2016**   **MAX. MARKS: 50**

Instructions to Candidates:
- ❖ Answer **ALL** the questions.
- ❖ Missing data may be suitable assumed.

1A.	What are the objectives of Energy Management System (EMS)?	*03*
1B.	With a neat sketch explain the connectivity of operating states in a Power system.	*03*
1C.	Draw a neat sketch and label the parts of On-line and Off-line functions in an EMS.	*04*
2A.	List and briefly explain at-least FOUR network analysis functions that constitute the working of an EMS.	*04*
2B.	Highlight the importance of state estimation in EMS.	*03*
2C.	What are the constraints that must be satisfied under normal operating conditions of power systems?	*03*

3A. Estimate the approximate currents flowing through the 10K resistors. Currents 1.5mA and 1.2mA are indicated by the ammeters.

04
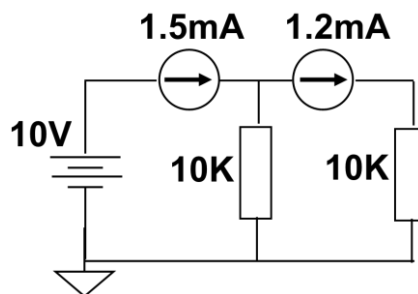
3B. Areas A and B are connected through a transmission corridor comprising identical transmission lines. A load of 1500MW is connected in area B, it is assumed that the generators in either area have a capacity that is sufficient to supply the entire load. The cost of supplying this load in Area A is Rs 20/MWh and in Area B is Rs 50/MWh. Design an economical system that supports a "N-1" secure dispatch. Cost of transmission line is Rs 1000 / MW.

Make suitable assumptions as required. Neglect transmission losses.

03

3C. Differentiate between Economic dispatch and Unit commitment with a suitable example.   *03*

4A. What are flexible and inflexible plants? How are they helpful in supplying power under emergency requirement?   *03*

4B. Explain how is economical division of plant load between generating units in a plant is achieved?   *03*

4C. A power plant has three units with the following cost characteristics:

$$C_1 = 0.5P_1^2 + 215P_1 + 5000 \quad \text{Rs / h}$$
$$C_2 = 1.0P_2^2 + 270P_2 + 5000 \quad \text{Rs / h}$$
$$C_3 = 0.7P_3^2 + 160P_3 + 9000 \quad \text{Rs/h}$$

where P is 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*

5A. List the various functions of SCADA.   *03*

5B. Highlight how DNP3 protocol is different from the OSI model, also mention the important features of DNP3 protocol.   *03*

5C. Draw and explain the ER model for recording energy consumption by the Lighting system in a building.   *04*