SMART GRID (ELL 772)
MAJOR EXAM – 2016

F.M.: 50

Time : 02 Hours

1. For the system given below, calculate the error injected in all the meters in order to launch the false data injection attack for,
   a. $\delta_2^{attack} = 0.95\delta_2^{true}$
   b. $\delta_2^{attack} = 0.95\delta_2^{true}$ and $\delta_3^{attack} = 1.05\delta_3^{true}$

   System Data:

   Assume $V^{spec} = 1.0pu$ for all the buses.

   $z_{12} = 0 + j0.02, z_{13} = 0 + j0.033, z_{23} = 0 + j0.025$(in per unit)

   Bus 1 (Slack Bus): $\delta_1 = 0$

   Bus 2 : $P_g = 0.0\ pu$and $P_d = 4.0\ pu$

   Bus 3 : $P_g = 5.0\ pu$ and $P_d = 2.0\ pu$ [3+4]

2. Classify the different cyber-attacks based on the violation of core information security principles. Explain briefly the difference between observable and unobservable false data injection attacks. [3+2]

3. (a) What are the operational objectives that are addressed by DSM alternatives? [2]

   (b) Explain the different type of load shape options? [4]

   (c) Rank in the descending order of importance of load shape options in the presence of (i) batteries, (ii) solar park and (iii) inelastic loads. Also, specify the rational of your ranking. [4]

   (d) List the load shapes that will benefit the operator in the occurrence of network congestion and during scheduled and unscheduled generator tripping. [4]

4. (a) What are the communication medias used for smart Grid ? [2x4]

   (b) Explain SQL attack and how it can be detected ?

   (c) Explain DDOS and how can it be launched ?

   (d) What are the different cyber based attacks related to critical infrastructure [4]

5. Discuss in detail a control systems attack model and types of attacks related to smart grid. [3]

6. What are the consumer enabled solutions in a smart grid [3]

7. (a) Write short notes on WAN, NAN, HAN [3 + 3]

   (b) What is the bandwidth and latency in (i) Demand response (ii) synchro-phasor (iii) Substation SCADA