

FEDERAL UNIVERSITY OF TECHNOLOGY OWERRI
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING
RAIN SEMESTER 2013/2014 EXAMINATION
PSE 514: SPECIAL TOPICS IN POWER SYSTEMS: 3 Hours
INSTRUCTIONS: ANSWER FIVE QUESTIONS

- 1(a) What are smart grids? (b) Outline the purpose, process and structure of its roadmap.
2. Write short notes on: (a) Electricity system needs for today and future in Nigeria. (b) Electrification of transport system. (c) Smart grid technologies. (d) Disadvantages of prepaid meter in Nigerian Electricity Distribution Companies (NEDC).
3. A principal factor in the performance of an organization is the quality of its products or services. With respect to the operations of many and various generation and distribution companies that deregulation has removed their protective shield in the Nigerian electricity industries, (a) Explain the concept and desirability of "Quality Management System (QMS) for Electricity Utilities". (b). Discuss any ten essential elements of QMS that may contribute significantly to the growth of Nigerian electricity industry in a deregulated and commercialized environment. (c). Recommend an appropriate QMS model that you may advise a newly established electricity distribution company that just hired you as its quality Engineer to adopt to ensure international listing of the firm. (d) With requisite organogram, discuss an appropriate QMS organizational structure that will suit your recommended model.
4. With the concept of keeping six honest serving men, namely WHAT, WHY, WHEN, HOW, WHERE and WHO to teach you all you need to know about restructuring and deregulation, as expounded by Brian R. Lunn (a). Discuss the processes that led to the successful deregulation of Northern Ireland electricity market. (b) State five lessons that you can borrow from North Ireland experience in the successful implementation of deregulation in Nigeria.
5. Globally, electric power systems have been undergoing liberalization. "Industry experts from all regions of the world concluded that the problem is isolated primarily to California." In the light of the above, advise the Nigerian government based on the experience gained from California to pave the way for successful transformation to improve the reliability of the system.
- 6(a) Mention five advantages of solar energy system over fossil fuel energy system. (b) Explain the statement that "hybrid renewable systems are more reliable than single source ones". (c) A certain solar installation is rated 10KVA with the inverter input voltage rated 120V. If the battery is rated 24V 400Ah, calculate the number of batteries required. (d) Draw the complete block diagram of a solar power system that supplies both DC and AC loads.
7. (a) What are the causes and disadvantages of a low power factor? (b) Draw the power factor correction schemes for a three-phase delta-connected load using (i) Delta-connected capacitor bank (ii) Star-connected capacitor bank (c) A Synchronous motor improved the power factor of a 500KW load from 0.707 lagging to 0.95 lagging. If at the same time, the motor carried a load of 100KW. Determine: (i) The leading reactive power (KVAR) supplied by the motor (ii) The apparent power (KVA) rating of the motor (iii) The power factor at which the motor operated

