KATHMANDU UNIVERSITY
End Semester Examination
March, 2022

Marks Scored:

Level : B.E.
Year : IV
Course : EPEG 426
Semester : II
Exam Roll No. :
Time : 30 mins.
F. M. : 10
Registration No. :
Date :

SECTION "A"
[20Q. × 0.5 = 10 marks]

Encircle the most appropriate option.

1. Which of these is not a power quality problem?
   a. Voltage sag b. Voltage swell c. Harmonics d. Sinusoidal voltage

2. The correct sequence in the evolution of smart-grid is?
   a. Electromechanical meter→AMR→AMI→Inter-connected grid
   b. Electromechanical meter→AMI→AMR→Inter-connected grid
   c. Electromechanical meter→AMR →Inter-connected grid→AMI
   d. Electromechanical meter→Inter-connected grid→AMR→AMI

3. Which of this is not an important factor in selecting optimum energy storage design?
   a. Type of storage b. Charge/discharge cycle
   c. Consumer behavior d. Cost and efficiency

4. Which one of these is true for the typical rating range and voltage level of distributed energy sources?
   a. 50-100 kW, below 25 kV b. 50-100 kW, above 25 kV
   c. 3-50 kW, below 25 kV d. 3-50kW, above 25 kV

5. In the case of distributed energy source integration into the grid, islanding is categorized as
   a. High severity baseline impact b. Medium severity baseline impact
   c. High severity high penetration impact d. Medium severity high penetration

6. The voltage deviation acceptable range is
   a. 5% for distribution system, 10% for transmission system
   b. 10% of distribution system, 5% for transmission system
   c. 5% for both distribution and transmission system
   d. 10% for both distribution and transmission system

7. In a grid, the potential to form an unintentional island does not depend on
   a. Generation to load ratio in the islanded section
   b. Frequency of the supply in the islanded section
   c. Reactive power balance in the islanded section
   d. Percentage of inverter-based generation and synchronous generation in the islanded section

8. Which one of these battery technologies has the highest efficiency?
   a. Lithium-ion b. Sodium Sulfide c. Lead acid d. Flow battery

9. Which of the following is not a feature of power converter used with energy storage system?
   a. Have high efficiency b. Provide fast response
   c. Can withstand high peak power d. Should manage low-rated power

10. The feature of a smart digital meter does not include
   a. High sampling rate b. High operating voltage
   c. High data rate d. High range

11. GSM is an example of which communication technology category?
   a. LAN b. WAN c. LPWAN d. Satellite

12. Which one of the following communication technology has high data rate and low range?
   a. Wifi b. Cellular c. Zigbee d. Satellite

13. What is not essential for electricity demand forecasting?
   a. Time series data of the past loads b. Time series data of the future loads
   c. Demographic data d. Seasonal factor

14. Which one of these is a security issue in smart grids?
   a. Voltage variation b. Intermittent energy sources
   c. Peak shaving d. Radio subversion or takeover

15. Which one of the following is true?
   a. PMU has lower resolution compared to SCADA system
   b. PMU can measure both magnitude and phase angle of voltage or current
   c. PMU does not have time synchronization option
   d. PMU is deployed for local monitoring and control

16. Which one of the following is not the application of data mining in transmission and distribution system?

a. Islanding detection
b. Fault identification
c. Power quality management
d. Load modeling

17. The equipment supply and installation cost falls under which cost category?

a. Capital cost
b. Fixed O&M cost
c. Variable O&M cost
d. Replacement cost

18. Net Present Cost of smart grid can be defined as

a. Present value of all the costs of installing and operating the components of smart grid over the project lifetime minus the present value of all the revenues that it earns over the project lifetime
b. Different between the present value of cash inflows and the present value of cash outflows over a period of time
c. Sum of all the costs associated with a smart grid over its lifetime or over a selected period of analysis, in today's value taking into account the time value of money
d. Sum of all the costs associated with a smart grid over its lifetime or over a selected period of analysis, in today's value without taking into account the time value of money

19. The measure of the average net present cost of electricity generation for a generating plant over its lifetime is known as

a. Cost of energy
b. Levelized cost of energy
c. Lifetime cost
d. Levelized lifetime cost

20. Which one of the following is not a favorable economic indicator for investment in a smart grid project?

a. NPC is low
b. NPV is negative
c. Payback period is low
d. BCR is high and greater than 1

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Time : 2 hrs. 30 mins.

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F. M. : 40

SECTION "B"
[4Q. × 10 = 40 marks]

Attempt ***ANY FOUR*** questions.

1.
a. Draw a schematic diagram of a traditional power system grid. Explain what addition or changes would you make it to make the grid smart. [6]
b. What is a SCADA system? Explain its working mechanism with a suitable diagram. [4]

2.
a. Explain the challenges for the integration of distributed/renewable energy sources to the grid. [6]
b. Explain with a suitable diagram how a wireless sensor network (WSN) works. [4]

3.
a. Explain briefly different economic indicators used for economic analysis of smart grids. List the decision rule among the alternatives. [6]
b. What is unintentional islanding and relay desensitization? Explain. [4]

4.
a. What is a battery energy storage system and what are its applications? Explain commonly used battery technologies with their merits and demerits. [6]
b. Explain the benefit of smart meters compared to traditional electromechanical meters. [4]

5.
a. Describe briefly the security issues related to smart grid. [6]
b. What is electricity demand forecasting? Explain the objectives of electricity demand forecasting. [4]