Renewable Energy and Distributed Generations

Lecture 16

Project assignments and Assessments

Lecturer: Teshome Goa (Assist. Prof.)

Final exam on Renewable Energy and Distributed Generations

The exam contains two parts:

Part I:Multiple choice and Part II: Subjective questions

The total Mark is : 100% Time allowed: 1:20 hrs

Name:_____ **ID no:**_____

Instruction I: Multiple choice questions

- For the questions, Question number one up to question number 40 choose the correct answer from th e given multiple choices and circle the right answer.

Each question weights : **2 marks .**

Question number one and two

1. Which one of the following is not true for the grid connected induction generator

a. Stator terminal is directly connected to the grid

b. Rotor is driven by prime mover at speeds higher than the synchronous speed

c. Needs gear box for increasing the rotational speed of wind to the standard generator speed

d. A well designed two fixed speed wind generator can harvests the same power as variable speed wind generator

2. Which one of the following is true about grid connected fixed speed wind generator

a. Used squirrel cage induction generator, which through the stator winding

b. Its speed vary within narrow range, maximum 1 % because it is coupled with grid

c. Needs soft-starter to limit starting current

d. All

Question number Three and Four

3. All of the following sentences the properties of fixed speed wind generator except

a. Need lower capital cost

b. Complex System configuration and weak mechanical design.

c. The rotor speed is nearly constant, fluctuations in wind-speed result in torque-excursions, which may lead to grid voltage fluctuation

d. An induction generator of the cage type with two speeds and a stator winding configuration for two distinct n umbers of poles operation is possible to generate two fixed speeds

4. The following statement is true about variable speed DFIG except

a. It operates in super synchronous speed

b. Operates in sub synchronous speed

c. when the rotor is moved at a super synchronous speed, the slip ’s’ is positive

d. the generator power is connected to the grid through both rotor and stator terminals , power fed to the grid fr om both

Question number Five and Six

5. Which one of the following is true about grid connected variable speed wind generator.

a. For maximization of the power output, the rotor side converter should be set at 00 (rectification mode), in the super sy nchronous region to draw power out of the rotor.

b. The grid-side converter enables power flow to the grid, keeping DC-link voltage level constant by controlling its firing angle

c. The intermediate smoothing reactor is needed to maintain current continuity and reduce ripple in the link circuit.

d. All

6. Which one of the following is not the planning stage activities for designing grid connected wind power plants .

a. Power flow

b. short-circuit

c. economic load dispatch and unit commitment analysis

d. network stability studies

Question number seven and eight

7. The following statement describes about the behavior of solar energy except

a. Not modular

b. It’s clean, carbon emission free and stable

c. Environmental friendly and reduced system and installation costs per years

d. Naturally gifted and highly feasible

8. Which one of the following is not true about the sustainable development goals agenda (Paris Agreement)

a. To have carbon emission free by 2025

b. Reducing environmental temperature to 1ocC per m2 area

c. Shift from conventional energy resources to renewable energy

d. Encouraging the thermal energy mix to the grid

Question number nine and ten

9. All of the following are very important for PV power generation , but one of the following is the most dominant p arts in generation of solar PV system

a. Solar cell or PV panel

b. Battery

c. Inverter

d. Charge controller

10. Which one of the following is not true about solar system

a. Solar cells are connected in series to increase the overall voltage

b. Connecting solar panel in series increases the overall string currents

c. When a modules are connected in parallel called solar string

d. Connecting solar PV panels in series and parallel increases the overall power harvesting

Question number eleven and twelve

11. One of the following module conversion efficiency better than others

a. Mono-crystalline silicon

b. Multi crystalline silicon

c. Organic

d. CIGS

12. The following factors affects the PV module performance except

a. Solar radiation or solar intensity

b. Cell temperature

c. Environmental conditions

d. None

Question number 13 and 14

13. The solar PV system generates maximum power output at

a. At the short circuit current

b. Open circuit voltage

c. Maximum current and maximum voltage

d. A and c

14. Which one of the following not true for solar OV system designing

a. Selecting the day of autonomy is very important for power continuity

b. The inverter input power is equal to the rating of power from PV array

c. Charge controller is very important to controlling the battery charging and reverse currents

d. As the cell temperature increase beyond the standard temperature the power harvesting from PV decrease

Question number 15 and 16

15. For maximum power harvesting using MPPT

a. Change in power output to change in voltage is zero

b. Change in power to change in voltage greater than zero

c. Change in power per change in voltage is less than zero

d. The power output is the product of shot circuit current and open circuit voltage

16. The following statement is true about centralized grid connected system except

a. Uses single inverter while connecting with the grid

b. simple structure, uses single transformer and single control loop

c. better power harvesting capability compared to string and multi-string configuration

d. used for three phase system

Question number 17 and 18

17. which one of the following grid connected solar configuration is not suitable for modular or scalable op eration

a. central inverter

b. string type inverter

c. multi-string operation

d. modular operation

18. The main problems in all grid connected PV configuration that needs critical design, operation and en gineering solution is

a. Voltage fluctuation

b. Frequency variations

c. Grid islanding

d. All

Question number 19 and 20

19. The power reserve control works as

a. In power reserve control, the PV must be regulated below MPP with the specific power reserve level

b. In Power ramp rate control, If the charge rate PV power is above certain limit the PV power is perturbed towards the left side of MPP

c. In power limiting control, the main problems in all configuration of grid connected systems are:

d. All

20. Which one of the following is false about hydropower plant

a. The discharge rate is one of the most dominant factor in hydropower generation

b. As neat head increase the power output generation increase

c. The converters efficiency may not have impact on the power output

d. None

Question number 21 and 22

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21. The hydropower is classified based on

a. Head

b. Operation

c. Size

d. All

22. While constructing the hydropower dam, the following condition is must:

a. Technical viability

b. Flood control

c. Obeying international water law

d. All

Question number 23 and 24

23. Which one of the following is not the types of geothermal energy resources

a. Hot water reservoir

b. Natural steam reservoir

c. Animal waste

d. Molten Magma

24. Motivation behind using geothermal energy

a. Environmental friendly

b. Reliable and doesn’t depend on whether condition

c. Doesn’t depend on neither sun nor wind

d. All

Question number 25 and 26

25. The following are the source of geothermal energy except

a. Heat source or earths

b. Reservoir

c. Fluid

d. Fuel

26. For the binary type geothermal power plant operates when the source:

a. Contains chemicals or minerals

b. Not hot enough

c. Needs additional fluids

d. All

Question number 27 and 28

27. Which one of the following is not true about geothermal energy

a. Important minerals can be extracted from the underground water

b. Binary and Hot Dry Rock plants have gaseous emission

c. Creates jobs and reduce resilience on oil

d. Could be online for long time without failures, 90 to 100% of the time compared to others

28. The following is true about biomass energy except

a. Derived from plants and animals wastes

b. Vital for fuel, particularly in underdeveloped countries where it is used for heating and cooking.

c. Agricultural biomass is not in cellulosic raw materials though it can be act as source for biomass energy

d. All

Question number 29 and 30

29. Which one of the following true about gasification type biomass energy process

a. biomass can be burned directly for heating buildings and water

b. Gas can be produced from biomass through a high temperature thermo-chemical process.

c. Involves burning biomass with sufficient air for full combustion

d. None

30. Which one of the following is true about power system planning

a. Generating an adequate energy for satisfying the demands at low price, efficient conversion system with low environmental and social impacts

b. Transmitting the generated energy through long distances to the load centers at low price, more efficient, stable and reliable conditions.

c. Distributing the power or energy considering quality service, low price and efficient utilization of the energy.

d. All

Question number 31 and 32

31. Which one of the following is not the main dependent variable for long-term load forecasting i n power system planning

a. Time

b. GDP

c. Per capita income

d. Trends of technology and population

32. Which one of the following factor is not affect unit availability in generation planning

a. Forced outage rate

b. repair time

c. Schedule maintenance

d. None

Question number 33 and 34

33. Which one of the following power plant is more flexible and highly applicable for quick start i n order to meet peak load

a. Hydropower

b. Thermal power plant

c. Nuclear power plant

d. Wind power plant

34. Which one of the following is not the characteristics of renewable energy technology

a. Clean environment

b. Unlimited supply

c. Zero GHG emission

d. Not Decentralized

Question number 35 and 36

35. Renewable energy to the grid needs critical analysis on ;

a. Planning

b. Physical Connection, grid integration

c. System Operation

d. All

36. The following statement is true about wind power except

a. The efficiency of offshore wind turbines is higher onshore

b. Operating wind power beyond bets limit is possible

c. Wind generates maximum power at its operating speed

d. Wind turbine stops operation at cut-off speed

Question number 37 and 38

37. One of the following is not true about horizontal wind turbine

a. Does not need yawing

b. Needs mechanical strong tower than vertical wind turbine

c. It has advantage of the larger speed in high height compared to Vertical wind turbine

d. Used gear box

38. One of the following is true about wind energy conversion

a. Air mass is constant in whatever surface

b. Force applied in wind power depend on the pressure difference between two volumes

c. The power output from wind is directly proportional to the wind speed in cubic

d. All

Question number 39 and 40

39. Which one is not true about wind power controlling

a. Fixed speed wind turbine control is a passive control scheme

b. Active stall wind turbine control is known as positive blade angle control

c. DFIG is a variable speed control type wind generator

d. Squirrel cage induction generator is affixed speed type wind power

40. Which one of the following is not true

a. Type-1 wind energy conversion has better voltage control capability than DFIG

b. The reactive power and voltage control capability of DFIG is better than Type-2 wind generator

c. Permanent magnet synchronous generator type wind energy conversion not requires the gear box.

d. None

Instruction II. Answer the following four questions as per the Request in space provided

Total mark= 20%

Each question weights five marks

Question number 41

41. The conditions which must be satisfied before the synchronizing switch will permit the closure to make integration of wind energy with grid are:

Question number 42

42. The main challenges or constraints in constructing solar PV project are:

Question number 43

43. T he five steps in sizing off-grid PV system are:

Question number 44

44. Based on their operation wind generators are classified into four. Mention them:

Answer Q. 1- Q.40

Instruction I:

1 D	16. C	26. D
2. D	17. A	27. B
3. b	18. d	28. C
4. C	19. D	29 b
5. D	20. c	30. d
6. C	21. d	31. A
7. A	22. D	32. D
8. D	23. C	33. A
9. A	24. D	34. D
10. C	25. d	35. D
11. A		36. b
12. D		37. a
13. c		38. D
14. B		39. B
15. a		40. A

Answer Q. 41

41.

- The frequency must be as close as possible with the grid frequency.
- The terminal voltage magnitude must match with that of the grid, preferably a few percent higher
- The phase sequence of both the three-phase voltages must be same.
- The phase angle between the two voltages must be within 5 degrees.

Answer Q. 42

42.

- ✓ Budget constraints: Build a system within your target budget.
- ✓ Space constraints: Build a system that is as space efficient as possible.
- ✓ Energy offset: Build a system that offsets a certain percentage of your energy usa ge
- ✓ Seasonality and sun light dependence
- ✓ Power storage: storing excess energy can be a challenge, as it often comes at an additional cost.
- ✓ Reduced Efficiency compared to other RE resources

Answer Q. 43

43.

- Estimating the Electric Load
- Sizing and Specifying Batteries
- Sizing and Specifying an Inverter,
- Sizing and Specifying an Array and specifying Controller
- Sizing of cables and wiring

Answer Q. 44

44.

- Type-1 WECS: Fixed speed wind energy conversion system (FSWECs)
- Type -2 WECs: Limited Variable wind energy conversion system(LVWECs)
- Type-3 WECs: Variable wind energy conversion system (VWECs)
- Type-4 WECs: Variable wind energy conversion system(VWECS)

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Project Assignment

45. Repeat the design project example in Lecture 12, subsection 5 considering your own country solar radiation data for the same load data.

- In addition, consider the mix of wind and hydro for grid connected system and develop the optimization solutions

Thank you !