Power Systems Operation and Control

Lecture 15

Project assignments and Assessments

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Final exam on Power Systems Operation and Control

The exam contains Three parts:

Part I:Multiple choice, Part II: True-False and Part III: Subjective questions

The total Mark is : 100%

Time allowed: 1:30 hrs

Name:_____

ID no:_____

Instruction I: Multiple choice questions

- For the questions, Question number one up to question number 30 choose the correct answer from the given multiple choices and circle the right answer.

Each question weights : **2 marks .**

Question number one and two

1. An electric power system that supplies power to homes and industries for a sizeable region is called

a. Generator

b. Grid

c. Transmission Line

d. Compensator

2. The main components of System are

a. Generation System

b. Transmission System and Distribution Systems

c. The Load

d. All

Question number Three and Four

3. All of the following are Renewable energy resource except

a. Solar power plant

b. Hydro power plant

c. Thermal power plant

d. wind Power plant

4. The knowledge of ----------needed for power flow analysis

a. Bus admittance matrix

b. Types of bus

c. The topology of network

d. All

Question number Five and Six

5. Which one of the following is used for the economic operation of power system .

a. Unit commitment

b. Economic load dispatch

c. Optimal power flow .

d. All

6. Which one of the following is not true about Unit commitment

a. Sharing the demand among all generation unit

b. Minimizing the startup cost of some of the power plant while starting quick starting power units

c. Sharing the demand among only the started generation but not for all units

d. Hydro power plant is used over thermal for peak demand supplying

Question number seven and eight

7. The following statement describes the control variables of thermal power plant except

a. Real power generation

b. Reactive power generation

c. Bus voltage magnitude

d. A and C

8. Which one of the following is true about the economic operation of thermal power plant

a. Minimizing the operational cost of the plant is main objective

b. Power generations are quadratic function

c. Marinating generation limit is one of the constraint's

d. All

Question number nine and ten

9. **which, one of the following is the i**mportance of ELD with the transmission line loss consideration

a. Minimizing the overall cost

b. Improving system efficiency

c. Maintaining stability

d. all

10. Which one of the following is not true about unit commitment

a. Checking the Power plant start-up and shutdown costs.

b. Determining the Operating expenses all base-case generation units

c. Evaluating the Ramp rates of units

d. Schedules for maintenance.

Question number eleven and twelve

11. One of the following not true about the equality constraints of optimal power flow

a. Operation cost minimization

b. Reducing emission

c. Checking the power transfer capability of lines

d. VAR investment reduction

12. The following is true about Stochastic OPF except

a. Addresses uncertainties by optimizing the worst-case scenario

b. Incorporates uncertainties in load

c. Considers generation uncertainty

d. Consider the market prices change

Question number 13 and 14

13. One of the following not true about hydrothermal scheduling

a. Hydro starts during peak load case

b. Large thermal unit can easily starts to supply the peak load compared to hydro

c. The objective function is to minimize the operating fuel cost thermal plants while maintaining water volume of hydro

d. it’s one of conventional power plant scheduling

14. One of the following is not true about hydrothermal-RE scheduling

a. Increase the grid mix opportunities

b. RE is the most regular and efficient power plant compared to hydro

c. Wind and solar power is affected by environmental conditions

d. The mix of hydro-thermal with RE reduces the emission

Question number 15 and 16

15. The following are the common decision variable of hydro-thermal plants except

a. Market Pricing, pricing decisions based on supply and demand.

b. Emissions Levels

c. Investment Decisions

d. None.

16. The primary objectives of power system control include

a. Ensuring the system remains stable under normal and abnormal conditions

b. Automatic generation control

c. Maintaining stability

d. All

Question number 17 and 18

17. which one of the following is not true about primary control of power system

a. provides a longer-term correction to restore system frequency and voltage

b. provides immediate response to changes in system conditions

c. primarily focusing on maintaining stability

d. none

18. One of the following is not true

a. For centralized control, the entire power system is monitored and controlled by a single central co ntroller

b. Distributed control makes use of several local controllers

c. Hierarchical Management is possible in centralized control

d. All

Question number 19 and 20

19. One of the following is not fundamental components while modeling the system for load frequency control

a. Modeling governor system

b. Turbine modeling

c. Generator modeling

d. None

20. Which one is not true for load frequency control

a. The generation frequency increases when load reduces

b. Generation scheduling is one of the most common techniques in load frequency control

c. The reference setting of power is one of the frequency control

d. Derivative control can minimize the error up to zero

Question number 21 and 22

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21. One of the following is the frequency dependent load

a. Motor load

b. Lighting load

c. Heating load

d. B and c

22. If the generation is not adequate enough to balance the load demand & loss, the most effectiv

e solution is

a. Starting thermal power plants

b. Load shedding

c. Generation rescheduling

d. None

Question number 23 and 24

23. Which one of the following is as free governor operation

a. Changing the reference power

b. Changing the load

c. Changing both the load and reference power

d. A and c

24. Which one of the following is not true about the Tie-line Power

a. AC-Tie line is very good for long transmission line

b. DC Tie-line needs converter stations

c. Multi-tie line enable for larger-scale power transfers and facilitate complex power trading agreements

d. All

Question number 25 and 26

25. One of the following is true about reactive power compensation

a. Maintain the bus voltage within the limit

b. maintain acceptable voltage at the receiving end during no-load and loaded condition

c. Capacitor generates reactive

d. All

26. One of the following is not true about power factor :

a. As power factor increases the system efficiency increase

b. The power factor is unity at industrial load

c. Capacitor boosts power factor

d. A and c

Question number 27 and 28

27. Which one of the following is not true about Uncompensated transmission lines' characteristics

a. Improved line loss

b. Poor voltage regulation

c. Good stability

d. High efficiency

28. The following is true about voltage control methods except

a. AVR Control

b. Transformer Tap changing

c. Synchronous Condensers

d. All

Question number 29 and 30

29. Which one of the following is the most common recent excitation system to control the voltage

a. DC excitation system

b. Ac excitation system .

c. Brushless AC excitation

d. None

30. Which one of the following is not true about Multiple Contingencies

a. Outage of two or more generation units at a time

b. N-1 Contingency

c. N-2 contingency

d. All

II. For the following question (questions from 1-to 10) say True if the statement is correct and say False if it's incorrect

Total mark= 20% **Each question weights 2 marks**

1. Balancing demand across various loads to prevent overloading and ensure efficient one of e ssence of economic operation of power system.
2. For automatic non-economic regulation, the output level of power plants changes around a b ase setting as area control error is fixed
3. For economic operation of power system, The incremental production cost, is made up of inc remental fuel cost plus the incremental cost of labor, water, maintenance etc
4. Unit commitment involves determining which generating units to turn ON or OFF over a speci fic time horizon to meet electricity demand reliably and cost-effectively
5. Optimal power flow typically focuses on none -real-time operation

Cont.…

6. The optimal scheduling problem in a hydro-thermal system can be stated as to minimize the fu el cost of thermal plants under the constraint of water availability for hydro-generation

7. Electric power must always be produced at a rate equal to its consumption because it cannot b e stored in vast quantities

8. In load frequency control, the Fly-balls moves downward when speed increases

9. In central load frequency control of a given control area, the change (error) in frequency is kno wn as Area Control Error (ACE).

10. AGC systems respond to variations in frequency or load by automatically modifying the output of generating units

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

Total mark= 20%

Each question weights five marks

Question number 31

31. The four basic components needs to be modeled for load frequency control are:

Question number 32

32. The four components model needed for AVR control are :

Question number 33

33. The difference and similarity between single area and Tie Line frequency control are? Mention at leas t four

Question number 34

34. What are the main economic operation methods of power systems?

Answer Q. 1- Q.30

Instruction I:

1 B	16. D	26. B
2. D	17. A	27. A
3. C	18. C	28. D
4. D	19. D	29 C
5. D	20. D	30. C
6. A	21. A	
7. C	22. B	
8. D	23. B	
9. D	24. A	
10. B	25. D	
11. C		
12. A		
13. B		
14. B		
15. D		

Answer For True-False Questions Q. 1- Q.10

1. True
2. False
3. True
4. True
5. False
6. True
7. True
8. False
9. True
10. True

Answer Q. 31

31.

- Governor system .
- Turbine system
- Generator system.
- Load system (Frequency dependent and Frequency independent).

Answer Q. 32

32.

- ✓ Voltage transformer or VT model
- ✓ Amplifier model .
- ✓ Excitation system model
- ✓ Generator model

Answer Q. 33

33.

- Both single area and Tie-line controls the frequency with respect of load change either by generation rescheduling or load shading emergency case)
- The single area control only focuses on controlling a given area frequency based on the load chan ge within the area
- Whereas, the tie-line frequency control should responds to the change in load from two or more inter connected area
- The Tie-line control also focuses on controlling the line power flow through interconnected network

Answer Q. 34

34.

- Economic load dispatch
- Unit commitment
- Optimal power flow
- Hydro-thermal and hydro-thermal , and RE schedulings

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Project Assignment

1. If three generators are interconnected into a grid is required to supply a maximum demand of 12 00 MW. Determine the ED of the generators neglecting transmission losses using Lagrange multipli er based on their input cost function as given below. See lecture 3 and lecture four for your referen ce while answering it.

$$C_1(P_{G1}) = 1100 + 20 * P_{G1} + 0.02P_{G1}^2\ USD/hr.$$
$$C_2(P_{G2}) = 600 + 14 * P_{G2} + 0.03P_{G2}^2\ USD/hr.$$
$$C_3(P_{G2}) = 400 + 6 * P_{G3} + 0.01P_{G3}^2\ USD/hr$$

Thank you !