

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Sixth Semester

Electrical and Electronics Engineering

20EEPC602 - POWER SYSTEM OPERATION AND CONTROL

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

**PART - A (MCQ) (20 × 1 = 20 Marks)**

Answer ALL Questions

Marks *K – Level* CO

- |  |   |    |     |
|--|---|----|-----|
| 1. The frequency of the power system control the<br>(a) Active power. (b) Reactive power. (c) (a) and (b) both. (d) None of them.  | 1 | K1 | CO1 |
| 2. The heart of the speed governor system, which controls the change in speed, is<br>(a) Linkage mechanism. (b) Fly-ball speed governor.<br>(c) Speed changer. (d) Hydraulic amplifier.  | 1 | K1 | CO1 |
| 3. The value of diversity factor is ..... than 1<br>(a) Equal to. (b) Lesser. (c) More (d) Greater   | 1 | K1 | CO1 |
| 4. What is a load factor?<br>(a) The ratio of average to maximum demand.<br>(b) The ratio of maximum demand to average load.<br>(c) The product of maximum demand and average load.<br>(d) The ratio of average load to the plant capacity.    | 1 | K1 | CO1 |
| 5. Main control loops in generating stations are<br>(a) ALFC. (b) AVR. (c) Both (a) and (b). (d) None of these.  | 1 | K1 | CO2 |
| 6. In an ALFC loop, $\Delta f$ can be reduced using _____ controller.<br>(a) Differential. (b) Integral. (c) Proportional. (d) All of these.   | 1 | K1 | CO2 |
| 7. A signal area system is one in which<br>(a) It is not connected to any other system.<br>(b) Total demand on the system should be fully met by its own local Generation.<br>(c) All generators swing together.<br>(d) All of these.          | 1 | K2 | CO2 |
| 8. In a signal area system, all generators working remain in synchronism maintaining their relative power angles; such a group of generators is called _____.<br>(a) Swing group. (b) Synchronous group. (c) Coherent group. (d) None of these | 1 | K1 | CO2 |
| 9. The voltage at the bus can be controlled by the injection of _____ power of the correct sign.<br>(a) Real. (b) Reactive. (c) Complex. (d) Both real and reactive.   | 1 | K1 | CO3 |
| 10. The function of a pilot exciter is<br>(a) To supply current to the rotor circuit.<br>(b) To maintain constant voltage excitation for the main exciter.<br>(c) To supply variable excitation for the main exciter.<br>(d) None of these.    | 1 | K1 | CO3 |
| 11. When the excitation increases, the current _____ and the power angle _____.<br>(a) Increases, increases. (b) Decreases, increases.<br>(c) Increases, decreases. (d) Decreases, decreases   | 1 | K1 | CO3 |
| 12. Disadvantages of shunt capacitors are _____.<br>(a) Fall of voltage. (b) Reduction in VArS.<br>(c) Reduction in effectiveness. (d) All of these.   | 1 | K1 | CO3 |

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|---|---|----|-----|
| 13. The economic dispatch problem is used to calculate  | 1 | K1 | CO4 |
| (a) Minimise the total cost of generating real power.   |   |    |     |
| (b) Minimise the total cost of generating reactive power.   |   |    |     |
| (c) Both A and B.   |   |    |     |
| (d) None of them.   |   |    |     |
| 14. The need for unit commitment are  | 1 | K1 | CO4 |
| (a) To reduce loss.   |   |    |     |
| (b) To reduce fuel cost.  |   |    |     |
| (c) Enough units will be committed to supply the system load.   |   |    |     |
| (d) All of the above.   |   |    |     |
| 15. Full load average production cost is  | 1 | K1 | CO4 |
| (a) (Net heat rate at full load) + fuel cost.   |   |    |     |
| (b) (Net heat rate at full load) * fuel cost.   |   |    |     |
| (c) (Net heat rate at full load) - fuel cost.   |   |    |     |
| (d) (Net heat rate at full load) / fuel cost.   |   |    |     |
| 16. Which of the following plant is expected to have the longest expected life?   | 1 | K1 | CO4 |
| (a) Hydroelectric.  |   |    |     |
| (b) Steam.  |   |    |     |
| (c) Diesel.   |   |    |     |
| (d) All have equal life.  |   |    |     |
| 17. National Load Dispatch Center is run by   | 1 | K1 | CO5 |
| (a) Power Grid Corporation of India Limited (PGCIL).  |   |    |     |
| (b) Power System Operation Corporation Limited (POSOCO).  |   |    |     |
| (c) Government of India.  |   |    |     |
| (d) Government of Delhi.  |   |    |     |
| 18. Automatic generation control is the one in which the following combination are included in ENERGY CONTROL CENTRE (ECC)  | 1 | K1 | CO5 |
| (a) Exciter and Generator.  |   |    |     |
| (b) Primary and Secondary ALFC.   |   |    |     |
| (c) AVR and ALFC.   |   |    |     |
| (d) All the above.  |   |    |     |
| 19. A central host computer server or servers called _____  | 1 | K1 | CO5 |
| (a) Switch.   |   |    |     |
| (b) Master Terminal Units (MTUs).   |   |    |     |
| (c) Junction Box.   |   |    |     |
| (d) Micro controller.   |   |    |     |
| 20. SCADA system encompass the transfer of data between a central host computer and a number of _____ and /or programmable logic controllers (PLCs), and the central host and the operator terminals. | 1 | K1 | CO5 |
| (a) Remote terminal units (RTUs).   |   |    |     |
| (b) Master Terminal Units (MTUs).   |   |    |     |
| (c) Junction Box.   |   |    |     |
| (d) Micro controller.   |   |    |     |

**PART - B (10 × 2 = 20 Marks)**

Answer ALL Questions

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|---|---|----|-----|
| 21. Interpret load curve and load duration curve.         | 2 | K2 | CO1 |
| 22. What is meant by free governor operation?             | 2 | K1 | CO1 |
| 23. What is meant by single area power system?            | 2 | K1 | CO2 |
| 24. List the functions of load frequency control.         | 2 | K1 | CO2 |
| 25. State reactive power generation.                      | 2 | K1 | CO3 |
| 26. Write any two applications of synchronous condensers. | 2 | K1 | CO3 |
| 27. Define crew constraints.                              | 2 | K1 | CO4 |
| 28. Outline the need of hydro thermal scheduling.         | 2 | K2 | CO4 |
| 29. Define restorative state.                             | 2 | K1 | CO5 |
| 30. Show the different operating states in power system.  | 2 | K2 | CO5 |

**PART - C (6 × 10 = 60 Marks)**

Answer ALL Questions

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|---|----|----|-----|
| 31. a) Outline the components of speed governor system of an alternator. Interpret the mathematical model of speed governor system with aid of block diagram. | 10 | K2 | CO1 |
| <b>OR</b>   |    |    |     |
| b) Illustrate the necessity of load forecasting and explain different methods load forecasting techniques in power system.                                    | 10 | K2 | CO1 |

32. a) Draw the block diagram of uncontrolled two area load frequency control system and describe the salient features under static condition. 10 K2 CO2
- OR**
- b) Explain with neat block diagram integration of economic dispatch with load frequency control. 10 K2 CO2
33. a) Develop the different methods of FACTS control. Summarize any two methods in detail. 10 K3 CO3
- OR**
- b) Experiment with stability compensation and give the effects of generator loading. 10 K3 CO3
34. a) Make use of unit commitment and explain briefly about the constraints on unit commitment. 10 K3 CO4
- OR**
- b) Utilizing short term hydro-thermal scheduling, give the objective function and constraints of short term hydrothermal scheduling in detail. 10 K3 CO4
35. a) Illustrate the various functions of energy control centre. 10 K2 CO5
- OR**
- b) Explain the substation control function arranged through SCADA system. 10 K2 CO5
36. a) i) Construct the Flow chart and explain Economic dispatch by  $\lambda$  Iteration method without loss. 5 K3 CO4
- ii) Plan the need of computer control of power system. 5 K3 CO5
- OR**
- b) i) Model Priority list method using full load average production cost. State the merits and demerits. 5 K3 CO4
- ii) Identify the major functions of system security control. 5 K3 CO5