**Electrical and Electronics Engineering**

**EE 2401 – POWER SYSTEM OPERATION & CONTROL**

**Question Bank**

**UNIT I**

**PART A**

1. Define connected load.
2. Define Plant Use Factor.
3. What is the need for load forecasting?
4. Define diversity factor.
5. What is meant by load frequency control?
6. Define load factor.
7. Define plant capacity factor.
8. What is the need of voltage regulation in power system?
9. Define the term maximum demand.
10. What is a “load curve”?
11. Compare load curve & load duration curve.
12. Define average load.
13. What is the need of frequency regulation in power system?
14. Define demand factor.
15. What are the various types of loads connected to the system?
16. Define utilization factor.
17. What is the effect of load factor on the cost of generation?
18. What is base load?
19. What is spinning reserve?
20. What is the purpose of primary ALFC?

**PART B**

21. (a) (i) With neat sketch, Describe the P-f and Q-V control structure. (8)

 (ii) A generating station supplies the following loads connected to it:

 Industries 95 MW

 Domestic lighting load 5 MW

 Domestic power load 8 MW

 Commercial load 12 MW

 The maximum demand on the station is 92 MW, Calculate the load factor and diversity factor if the total number of units generated in a year is 3×108. (8)

 22. (i) what are system level and plant level controls? (6)

 (ii) Define diversity factor. Discuss the practical ways to improve the diversity factor. (6)

 (iii) Write short notes on Load Forecasting. (4)

 23. (a) (i) A generating station has the following daily load cycle. (10)

Time (hrs) 0-6 6-10 10-12 12-16 16-20 20-24

Load (MW) 40 50 60 50 70 40

Draw the load curve and find

1. Maximum demand
2. Units generated per day
3. Average load
4. Load factor

 (ii) Explain the following terms

Installed reserve, spinning reserve, cold reserve.

Or

 24. Discuss in detail the recent trends in real time control of power systems. (16)

 25. (i) Explain why the frequency should be maintained within a narrow rigid limit. (6)

 (ii) Consider an inductive load of type Z=R+jX.

1. By how many percent will the real load drop if the voltage is reduced by 5%. (5)
2. How would a 2% drop in frequency affects the real load, if the load is assumed to have a power factor of 0.8? (5)

 26. A generating station has a maximum demand of 20 MW, a load factor of 60% a plant capacity factor of 48% and a plant use factor of 80% Find the

1. Daily energy produced
2. Reserve capacity of the plant
3. Maximum energy that could be produced daily if the plant were running all the time and
4. Maximum energy that could be produced if the plant when running (according to operating schedule) were fully loaded. (16)

 27. Explain the various objectives of power system and various control strategies during its operation. (16)

28. (i) A generating station has a maximum demand of 50,000 kW. Calculate the cost per unit generated from the following data. (12)

 Capital cost = Rs. 95×10^6

 Annual load factor =40%

 Annual cost of fuel and oil =Rs 9×10^6

 Taxes, wages and salaries etc =Rs7.5×10^6

 Interest and depreciation =12%

 (ii) Write short notes on economic Dispatch Control (EDC). (4)

 29. (i) What is meant by chronological load curve ? Give the information obtained from load curve. (3+5)

 (ii) Highlight briefly the importance of regulating frequency and voltage of the power system. (8)

30. (i) A power station has to meet the following demand

Group A: 200 kW between 8 A.M and 6 P.M

Group B: 100 kW between 6 A.M and 10 A.M

Group C: 50 kW between 6 A.M and 10 A.M

Group D: 100 kW between 10 A.M and 6 P.M and then between 6 P.M and 6 A.M

Plot the daily load curve and determine diversity factor, units generated per day and load factor. (8)

(ii) Discuss about the recent trends in real time control of power systems. (8)

**UNIT II**

**PART A**

1. Compare the functions of “Speed Governor” and “Speed Changer” in a speed governing system of a turbine-generator set.

2. What is “AGC”?

3. What do you understand by coherent group of generators?

4. List the advantages of multi-area operation.

5. What is meant by free governor operation?

6. What is the function of load frequency control on a power system?

7. How is the real power in a power system controlled?

8. Define per unit droop.

9. What are the conditions necessary for sharing load operating in parallel between the two synchronous machines?

10. Define area control error.

11. State the advantages of state variable model.

12. Define inertia constant.

13. Write the tie line power deviation equation in terms of frequency.

14. What is meant by control area?

15. What is meant by AFRC?

16. State whether changes in AVR loop will be reflected in ALFC loop.

17. What are the assumptions made in dynamic response of uncontrolled case?

18. Explain the principle of tie-line bias control.

19. Differentiate static and dynamic response of an ALFC loop.

20. Give two conditions for proper synchronizing of alternators.

**PART B**

21. Explain the static and dynamic response of single area system. (16)

22. Two synchronous generators operating in parallel. Their capacities are 300 MW and 400 MW. The droop characteristics of their governor are 4% and 5% from no load to full load. Assuming that the generators are operating at 50 Hz at no load, how would be a load of 600 MW shared between them. What will be the system frequency at this load? Assume free governor action. (16)

23. Develop the block diagram model of a two area LFC system and obtain its static response. (16)

24. (i) Discuss the integration of economic dispatch control with automatic generation control. (8)

 (ii) Derive an expression for load sharing between two alternators. What are the effects of fuel supply and change of excitation? (8)

25. How is speed governor mechanism modeled? Explain its operations with the speed load characteristics? (16)

26. What are the components of speed governor system of an alternator? Derive its transfer function with an aid of a block diagram. (16)

27. Develop the state variable model of a two area system and state the advantages of the model. (16)

28. Two 100 kW alternators operate in parallel. The speed regulation of first alternator is 100% to 103% from full load to no load and that of other 100% to 105%. How will the two alternators share a load of 1200kW and at what load will one machine cease to supply any portion of the load? (16)

29. With a neat block diagram analyze static and dynamic response of two area system. (16)

30. (i) Develop the mathematical model for tie line. (8)

 (ii) Explain the static response of single area system. (8)