UNIT-I – INTRODUCTION
PART-A
2 MARK QUESTIONS WITH ANSWERS

1. What is load curve?

The curve drawn between the variations of load on the power station with reference to time is known as load curve. There are three types, Daily load curve, Monthly load curve, Yearly load curve

2. What is daily load curve?

The curve drawn between the variations of load with reference to various time period of day is known as daily load curve.

3. What is monthly load curve?

is obtained from daily load curve. Average value of the power at a month for a different time periods are calculated and plotted in the graph which is known as monthly load curve

4. What is yearly load curve?

It is obtained from monthly load curve which is used to find annual load factor.

5. What is connected load?

It is the sum of continuous ratings of all the equipments connected to supply systems.

6. What is Maximum demand?

It is the greatest demand of load on the power station during a given period.

7. What is Demand factor?

It is the ratio of maximum demand to connected load. Demand factor= (max demand)/ (connected load)

8. What is Average demand?

The average of loads occurring on the power station in a given period (day or month or year) is known as average demand. Daily avg demand = (no of units generated per day)/ (24 hours) Monthly avg demand = (no of units generated in month)/ (no of hours in a month) Yearly avg demand = (no of units generated in a year)/ (no of hours in a year)

9. What is Load factor?

The ratio of average load to the maximum demand during a given period is known as load factor.

Load factor = (average load)/ (maximum demand)

10. What is Diversity factor?

The ratio of the sum of individual maximum demand on power station is known as diversity factor.
Diversity factor = (sum of individual maximum demand)/(maximum demand).

11. What is Capacity factor?

This is the ratio of actual energy produced to the maximum possible energy that could have been produced during a given period.
Capacity factor= (actual energy produced)/ (maximum energy that have been produced)

12. What is Plant use factor?

It is the ratio of units generated to the product of plant capacity and the number of hours for which the plant was in operation.
Units generated per annum= average load * hours in a year

13. What is Load duration curve?

When the load elements of a load curve are arranged in the order of descending magnitudes the curve then obtained is called load duration curve.

14.What are the Plant level controls?

The Plant level control consists of

- Speed Governor control or Primary Automatic Load Frequency Control(ALFC).
- Excitation control or Automatic Voltage Regulator (AVR) control.

15.What is the need for Voltage regulation in power system?

- Variations in supply voltage are detrimental to electrical appliances.
- For a specified power rating,when the supply voltage is less,the current drawn is more and it will give rise to heating problems.

16. What is the need for Load forecasting in a power system?

- To meet our future demand.
- Long term forecasting is required for preparing maintenance schedule of the generating units, planning future expansion of the system.
- For day-to-day operation, short term load forecasting demand and for maintaining the required spinning reserve.

17.What are the advantages of Computer control in power system?

The main advantages of computer control in power system are

- Optimal operation and control
- Low maintenance and operating cost
- High speed of operation
- Maximum accuracy and high reliability
- Fast network monitoring

18. Define Reserve capacity.

To meet the increase in load demand a power system is designed with some reserve capacity. The difference between Load factor and plant capacity factor is an indication of reserve capacity.

19. What is the role of computers in the operation and control of power systems?

- Real time functions(monitoring and control)
- Support of the user interface
- Run operating studies
- Simulation studies for operator training

20.What is the difference between Load and load duration curve?

Load curve is a curve plotted between the load and time. This curve shows the variation of load on the power station with respect to time.

When the load elements of the load curve are arranged in the order of descending magnitude, the curve thus obtained is called a load duration curve.

PART-B & C QUESTIONS

1.i) Define the following: (1) Hot reserve (2) Cold reserve (3) diversity factor

2. Describe the following: (i) Load forecasting (ii) Economic dispatch control.

3. (i) Explain the following terms: Installed reserve, spinning reserve, cold reserve, hotreserve.

(ii)A power station has to meet the following demand:

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

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

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

Group D:100KW between 10 A.M and 6 P.M and then between 6 P.M and 6 A.M. Plot the daily load curve and calculate diversity factor, units generated per day and load factor.

4. (i) Quote the objectives of modern trend in real time control of power system? Explain the significant features of computer control in power system.

(ii) Describe on load forecasting.

5. Describe briefly about plant level and system level control.

6. i) Classify load curve and load duration curve elaborately?

ii) Describe the importance of load forecasting and explain the method of least square fit forecasting the base load.

7. i) Show the p-f and Q-V control structure.

ii) Describe the following terms

i. Maximum Demand

ii. Plant use factor

iii. Plant capacity factor

iv. Reserve capacity

8. Summarize objectives of modern trend in real time control of power system? Explain the significant features of computer control in power system.

9. (i) Explain the need for voltage and frequency regulation in power system

(ii) A generating station has maximum demand of 400 MW. The annual load factor is 65% and capacity factor is 50% evaluate the reserve capacity of the plant.
10. Analyze the need for voltage and frequency regulation in power system

UNIT-II – REAL POWER FREQUENCY CONTROL

1. What is the major control loops used in large generators?

The major control loops used in large generators are
1. Automatic voltage regulator (AVR)
2. Automatic load frequency control (ALFC).

2. What is the use of secondary loop?

A slower secondary loop maintains the fine adjustment of the frequency, and also by reset action maintains proper MW interchange with other pool members. This loop is insensitive to rapid load and frequency changes but focuses instead on drift like changes which take place over periods of minutes.

3. What is the adv of AVR loop over ALFC?

AVR loop is much faster than the ALFC loop and therefore there is a tendency, for the VR dynamics to settle down before they can make themselves felt in the slower load frequency control channel.

4. What is the diff. between large and small signal analysis?

Large signal analysis is used where voltage and power may undergo sudden changes of magnitude that may approach 100 percent of operating values. Usually this type of analysis leads to differential equations of non-linear type. Small signal analysis is used when variable excursions are relatively small, typically at most a few percent of normal operating values.

5. What is the exciter?

The exciter is the main component in AVR loop. It delivers the DC power to the generator field. It must have adequate power capacity and sufficient speed of response (rise time less than 0.1 sec).

6. What is the function of AVR?

The basic role of the AVR is to provide constancy of the generator terminal voltage during normal, small and slow changes in the load.

7. Explain about static AVR loop?

The AC power is rectified by thyristor bridges and fed into the main generator field via slip rings. Static exciters are very fast and contribute to proved transient stability.

8. Write the static performance of AVR loop?

The AVR loop must regulate the terminal |V| to within required static accuracy limit. Have sufficient speed of response. Be stable.

9. What is the dis.adv of high loop gain? How is to be eliminated?

In a static AVR loop, the execution power is obtained directly from the generator terminals or from the station service bus. High loop gain is needed for static accuracy but this causes undesirable dynamic response, possibly instability. By adding series AND/OR feedback stability compensation to the AVR loop, this conflicting situation can be resolved.

10. What are the effects of generator loading in AVR loop?

Added load does not change the basic features of the AVR loop, it will however affect the values of both gain factor Kf and the field constant. High loading will make the generator work at higher magnetic saturation levels. This means smaller changes in |E| for incremental increases in if, translating into the reduction of KF. The field time constant will likewise decreases as generator loading closing the armature current paths. This circumstance permits the formation of transient stator currents the existence of which yields a lower effective field induction.

11. What are the functions of ALFC?

The basic role of ALFCs is to maintain desired MW output of a generator unit and assist in controlling the frequency of large interconnection. The ALFC also helps to keep the net interchange of power between pool members at predetermined values. Control should be applied in such a fashion that highly differing response characteristics of units of various types are recognized. Also unnecessary power output changes should be kept at a minimum in order to reduce wear of control valves.

12. Specify the dis.adv of ALFC loop?

The ALFC loop will main control only during normal changes in load and frequency. It is typically unable to provide adequate control during emergency situations, when large MW imbalances occur.

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

The real power in a power system is being controlled by controlling the driving torque of the individual turbines of the system.

14. What is the need for large mechanical forces in speed-governing system?

Very large mechanical forces are needed to position the main valve against the high stream pressure and these forces are obtained via several stages of hydraulic amplifiers.

15.State any two necessities to put alternators in parallel.

- Local or regional power may exceeds the power of a single available generation.
- Parallel alternators allow one or more units to be shut down for schedules or emergency maintenance while the load is being supplied with power.

16.Give two conditions for proper synchronising of alternators.

- The terminal voltage of the incoming machine must ne exactly equal to that of the others of the bus bars connecting to them.
- The speed of the incoming machine must be such that its frequency equals to the bus bar frequency.
-

17.Define Regulation

Regulation is defined as percentage rise in voltage when full load at the specified power factor is switched off, the excitation being adjusted to give normal voltage

%Regulation=Eo-V/V *100

Where, Eo=No load voltage V=on load voltage

18.What is meant by control area?

It is possible to divide an extended power system in to sub areas in which the generators are tightly coupled together to form a coherent group.

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

- Neglect the turbine dynamics.
- The speed changer action is instantaneous.

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

The control strategy is termed as tie line bias control and is biased upon the the principle that all operating pool members must contribute their share to frequency control in addition to taking care of their own net interchange.

PART-B & C QUESTIONS

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

2. Develop the state variable model of a two area system and state the advantages of the model.

3. Draw the block diagram of uncontrolled two area load frequency control system and describe the salient features under static condition.

4. Analyze speed governor mechanism model? Explain its operations with the speed load characteristics.

5. Examine and derive the transfer function model and draw the block diagram for single control area provided with governor system. From the transfer function derive the expression for steady state frequency error for a step load change.

6. Discuss the components of speed governor system of an alternator? Derive its transfer function with an aid of a block diagram.

7. Two 1000KW 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%. Show how will the two alternators share load of 1200KW and at what will one machine cease to supply

any portion of the load.

8. For a system regulation =4Hz/p.u.MW,K_p=150 T_p=18sec,ΔP_0=0.01p.u.Calculate the dynamic response of uncontrolled case. Explain and derive the equation used.
9. Deduce the expression for steady state frequency change for single area system with the following cases.
(i)Changes in load with fixed speed
(ii)Changes in speed with fixed demand

UNIT-III - REACTIVE POWER -VOLTAGE CONTROL

1. What are the sources of reactive power? How it is controlled?

The sources of reactive power are generators, capacitors, and reactors.
These are controlled by field excitation.
Give some excitation system amplifier.
The excitation system amplifiers are,
a) Magnetic amplifier
b) Rotating amplifier
c) Modern electronic amplifier.

2. When is feedback stability compensation used?

High loop gain is needed for static accuracy but this causes undesirable dynamic response, possibly instability. This conflicting situation is resolved by adding feedback stabling compensation to the AVR loop.

3. Give the characteristics of line compensators?
The characteristics of line compensators are,

a. Ferranti effect is minimized

b. Under excited operation of synchronous generator is not required.

4. What is known as bank of capacitors? How it is adjusted?

When a number of capacitors are connected in parallel to get the desired capacitance, it is known as bank of capacitors. These can be adjusted in steps by switching (mechanical).

5. What is the disadvantage of switched capacitors are employed for compensation?

When switched capacitors are employed for compensation, these should be disconnected immediately under light load conditions to avoid excessive voltage rise and Ferro resonance in presence of transformers

6. What are the effects of capacitor in series compensation circuit?

The effects of capacitor in series compensation circuit are, Voltage drop in the line reduces. Prevents voltage collapse. Steady state power transfer increases. Transient stability limit increases.

7. Give two kinds of capacitors used in shunt compensator?

The two kinds of capacitors used in shunt compensator are, a. Static Var Compensator (SVC) : These are banks of capacitors (sometimes inductors also for use under light load conditions).

8. What is synchronous condenser?

It is a synchronous motor running at no-load and having excitation adjustable over a wide range. It feeds positive VARs into the line under overexcited conditions and negative VARs when under excited.

9. Write about Static VAR Compensator (SVC)

These comprise capacitor bank fixed or switched or fixed capacitor bank and switched reactor bank in parallel. These compensators draw reactive power from the line thereby regulating voltage, improve stability (steady state and dynamic), control overvoltage and reduce voltage and current unbalances. In HVDC application these compensators provide the required reactive power and damp out sub harmonic oscillations.

10. What is Static VAR Switches or Systems?

Static VAR compensators use switching for var control. These are also called static VAR switches or systems. It means that terminology wise SVC=SVS. And we will use these interchangeably

11. Give some of the Static compensators schemes.

a. Saturated reactor b. Thyristor- Controlled Reactor (TCR) c. Thyristor Switched capacitor (TSC) d. Combined TCR and TSC compensator.

12. What is tap changing transformers?

All power transformers and many distribution transformers have taps in one or more windings for changing the turn"s ratio. It is called tap changing transformers.

13. Write the types of tape changing transformers.

a. Off- load tap changing transformers. b. Tap changing under load transformers.

14. What is the use of off-load tap changer and TCUL ?

The off- load tap changers are used when it is expected that the ratio will need to be changed only infrequently, because of load growth or some seasonal change. TCUL is used when changes in ratio may be frequent or when it is undesirably to de-energize the transformer to change the tap.

15.Give the function of AVR.

The function of automatic voltage regulator is to regulate the output of generator voltage and thereby regulate the reactive power flow.

16.What is an Exciter?

Exciter is a device or combination of devices which supplies the magnetizing current to generate the working flux. The purpose of the exciter is to supply excitation dc voltage to the fixed poles of generator.

17.What is meant by stability compensation?

In order to get static accuracy high loop gain is needed. But this high loop gain causes undesirable dynamic response, possible instability. The stability compensation improves the dynamic response characteristics with out offering static loop gain. The stability compensation will damp out the oscillations in the system.

18.State the advantages of switching capacitors in voltage control.

- Transient free switching is ensured.
- Damping of energizing transients
- Harmonic reduction
- The system voltage can be maintained within the desired range.

19.What are the methods of voltage control?

- Excitation control
- Static shunt capacitors
- Static series capacitors
- Static shunt reactors
- Synchronous condensers

20.Show that voltage control and reactive power control are interrelated.

Voltage and reactive power control have a significant impact on system stability. The reactive power flow is minimized so as to reduce I^2 R and I^2 X losses and to operate the transmission system efficiently.

PART-B & C QUESTIONS

1. Examine various methods of voltage control and explain any three in detail.
2. (i) Name the generators and consumers of reactive power in a power system.
   (ii) Describe static VAR compensators? Quote the advantages of SVS.
3. Explain the following methods of voltage control (i) Tap changing transformers (ii) Shunt reactors (iii) Synchronous phase modifiers (iv) Shunt capacitors (v) series capacitors.
4. Examine the circuit for a typical excitation system and derive the transfer function model and draw the block diagram.
5. Describe the different methods of voltage control? Examine any two methods in detail.
6. (i) Develop a typical excitation arrangement to control the voltage of an alternative and explain.
(ii) Explain the role of tap changing transformer in voltage control?
7. Explain Static VAR compensator? Explain its operation. Also state the merits of static

VAR compensator over the other methods of voltage control.
8. (i)Demonstrate in brief about generation and absorption of reactive power.
(ii) Point out the relations between voltage, power and reactive power at a node for applications in power system control.
9. Analyze various methods of reactive power control and explain any two in detail.
10. Discuss static and dynamic analysis of AVR**.**

UNIT-IV – UNIT COMMITMENT AND ECONOMIC DISPATCH

1. Define economic dispatch problem?

The objective of economic dispatch problem is to minimize the operating cost of active power generation.

2. Define incremental cost?

The rate of change of fuel cost with active power generation is called incremental cost. Write the load balance equation? Pg-pd-pl=0.

3. Define base point?

The present operating point of the system is called base point.

4. Define participation factor?

The change in generation required to meet power demand is called as participation factor.

5. Define hydrothermal scheduling problem?

The objective is to minimize the thermal generation cost with the constraints of water availability.

6. Define Unit commitment?

Commitment of minimum generator to meet the required demand.

7. Define spinning reserve?

It is the term describe the total amount of generation availability from all units synchronized on the system.

8. What is meant by scheduled reserve?

These include quick start diesel turbine units as well as most hydro units and pumped storage hydro units that can be brought online, synchronized and brought up to full capacity quickly.

9. What are the thermal unit constraint?

Minimum up time, minimum down time crew constraints.

10. Define minimum up time?

Once the unit is running, it should not be turned off immediately.

11. Define min.down time?

Once the unit is decommited, there is a minimum time before it can be recommended.

12. Define crew constraints?

If a plant consist of two (or) more units, all the units cannot be turned on at the same time since there are not enough crew members to attend both units while starting up.

13. What are the two approaches to treat a thermal unit to operating temperature?

The first allow the unit boiler to cool down and then heat backup to operating temperature in time for a scheduled turn on. The second requires that sufficient energy be input to the boiler to just maintain operating temperature.

14. What are the techniques for the solution of the unit commitment problem?

Priority list method dynamic programming Lagrange relation

15. What are the assumptions made in dynamic programming problem?

A state consists of an array of units with specified units operating and the rest of the time. The start up cost of a unit is independent of the time it has been offline. There are no costs for shutting down the units.

16. Define long range hydro scheduling problem?

The problem involves the long range of water availability and scheduling of reservoir water releases. For an interval of time that depends on the reservoir capacities.

17. What are the optimization technique for long range hydro scheduling problem?

Dynamic programming composite hydraulic simulation methods statistical production cost.

18. Define short range hydro scheduling problem?

It involves the hour by hour scheduling of all generators on a system to achieve minimum production condition for the given time period.

19. Define system blackout problem?

If any event occurs on a system that leaves it operating with limits violated, the event may be followed by a series of further actions that switch other equipment out of service. If the process of cascading failures continues, the entire system of it may completely collapse. This is referred as system blackout.

20. What is meant by cascading outages?

If one of the remaining lines is now too heavily loaded, it may open due to relay action, thereby causing even more load on the remaining lines. This type of process is often termed as cascading outage.

PART-B & C QUESTIONS

1. Explain the unit commitment problem. With the help of a flow chart, explain forward dynamic programming solution method of unit commitment problem.
2. The fuel inputs per hour of plants 1 and 2 are given as

F1= 0.2P12+40P1+120Rs/hr

F2=0.25P22+30P2+150Rs/hr

Calculate the economic operating schedule and the corresponding cost of generation. The maximum and the minimum loading on each unit are 100MW and 25MW. Assume the transmission losses are ignored and the total demand is 180MW. Also determine the saving obtained if the load is equally shared by both units.

3. (i) With the help of Flow chart explain Economic dispatch by λ Iteration method loss. (ii) The fuel cost of two units are given by

F1=F1 (PG1) = 1.5+20PG1+0.1PG12 Rs\hr

F2=F2 (PG2) = 1.9+30PG2+0.1PG22Rs\hr

If the total demand on the generator is 200 MW. calculate the economic load scheduling of the two units.

4. (i) Describe unit commitment problem? List the constraints that are to be accounted in unit commitment problem.

(ii) Give out the priority list of unit commitment using full load average production cost for the given data:

Heat rate of unit1 H1= 510+7.2PG1+0.00142 PG12MW\hr

Heat rate of unit2 H2= 310+7.85PG2+0.00194PG22MW\hr

Heat rate of unit3 H3= 78+7.97PG3+0.00482PG32MW\hr. PD=500MW

Unit	Mm(MW)	Max(MW)	Fuel Cost (K)
1	150	600	1.1
2	100	400	1.0
3	50	200	1.2

5. The fuel cost functions for three thermal plants in $/h are givenby

F1=0.004Pg12+5.3Pg1+500

F2=0.006Pg22+5.5Pg2+400

F3=0.009Pg32+5.8Pg3+200 where Pg1,Pg2,Pg3 are in MW.

Estimate the optimal dispatch and the total cost when the total load is 925 MW with the following generator limits.

100MW≤Pg1≤450MW,

100MW≤Pg2≤350MW,

100MW≤Pg3≤225MW

6. (i)Evaluate the priority list for the units given below.

H1=510+7.20P1+0.00142P12 .Pmin=150MW.Pmax=600MW. Fuel cost=1.1Rs/MBtu.

H2=310+7.85P2+0.00194P22 .Pmin=100MW.Pmax=400MW.Fuel cost=1.0Rs/MBtu
H3=78+7.97P3+0.00482P32 .Pmin=50MW.Pmax=200MW.Fuel cost=1.2Rs/MBtu
ii)Deduce the co ordination equation with losses neglected.

7. (i) The cost characteristics of three plants of a system are
C1=0.05P12+17.0P1+160 Rs/hour
C2=0.06P22+14.4P2+200 Rs/hour
C3=0.08P32+9.0P3+240 Rs/hour Where P1,P2,P3 are in MW.
The incremental transmission losses for the network with respect to plants 1,2 and 3 are 0.05,0.10 and 0.15 MW per MW of generation. Examine the optimal dispatch for a total load of 100MW and also its incremental cost of received power.
ii) The input output curve characteristics of three units are
F1=750+6.49Pg1+0.0035Pg12.
F2=870+5.75Pg2+0.0015Pg22.
F3=620+8.56Pg3+0.001Pg32. The fuel cost of unit 1 is 1.0 Rs/MBtu, 1.0 Rs/MBtu for unit 2 and 1.0 Rs/MBtu for unit 3. Total load is 800MW. Use the participation factor method to Estimate the dispatch for a load is increased to
880MW?
8. (i)Formulate the Forward Dynamic Programming method of solving unit commitment problem with neat flow chart.
(ii) Compose the priority list method of solving unit commitment Problem. State merits and limitations of this method.

UNIT-V – COMPUTER CONTROL OF POWER SYSTEMS

1. What are the functions of control center?

System monitoring contingency analysis security constrained optimal power flow.

2. What is the function of system monitoring?

System monitoring provides upto date information about the power system.

3. Define scada system?

It stands for supervisory control and data acquisition system, allows a few operators to monitor the generation and high voltage transmission systems and to take action to correct overloads.

4. What are the states of power system?

Normal state alert mode contingency mode emergency mode. Define normal mode? The system is in secure even the occurrence of all possible outages has been simulated the system remain secure is called normal mode.

5. Define alert mode?

The occurrence of all possible outages the system does not remain in the secure is called alert mode.

6. What are the distribution factors?

Line outage distribution factor, generation outage distribution factor.

7. Define state estimation?

State estimation is the process of assigning a value to an unknown system state variable based on measurements from that system according to some criteria.

8. Define max. likelihood criterion?

The objective is to maximize the probability that estimate the state variable x, is the true value of the state variable vector (i.e, to maximize the P(x)=x).

9. Define weighted least-squares criterion?

The objective is to minimize the sum of the squares of the weighted deviations of the estimated measurements z, from the actual measurement.

10. Define minimum variance criterion?

The objective is to minimize the expected value of the squares of the deviations of the estimated components of the state variable vector from the corresponding components of the true state variable vector.

11. Define must run constraint?

Some units are given a must run status during certain times of the year for reason of voltage support on the transmission network.

12. Define fuel constraints?

A system in which some units have limited fuel or else have constraints that require them to burn a specified amount of fuel in a given time.

13. What are the assumptions made in priority list method?

No load cost are zero unit input-output characteristics are linear between zero output and full load there are no other restrictions start up cost are affixed amount.

14. State the adv of forward DP approach?

If the start up cost of a unit is a function of the unit is a function of the time it has been offline, then a forward dynamic program approach is more suitable since the previous history of the unit can be computed at each stage.

15. State the dis.adv of dynamic programming method?

It has the necessity of forcing the dynamic programming solution to search over a small number of commitment states to reduce the number of combinations that must be tested in each period.

16. What are the known values in short term hydro scheduling problem?

The load, hydraulic inflows & unit availabilities are assumed known. What is meant by telemetry system? The states of the system were measured and transmitted to a control center by means of telemetry system.

17. What are the functions of security constraints optimal power flow?

In this function, contingency analysis is combined with an optimal power flow which seeks to make changes to the optimal dispatch of generation. As well as other adjustments, so that when a security analysis is run, no contingency result in violations.

18. Define the state of optimal dispatch?

This is the state that the power system is in prior to any contingency. It is optimal with respect to economic operation but may not be secure.

19.What is SCADA?

SCADA is Supervisory Control and Data Acquisition system that allows operators to monitor the generation and HV transmission system.

20.What are the functions of SCADA?

- Monitoring
- Data logging
- Data acquisition
- ON/OFF control
- Alarm
- Control and indication of AGC

PART-B & C QUESTIONS

1. Discuss various functions of SCADA with neat diagram. Also list some of the common features of all SCADA systems
2. Discuss the various functions, system monitoring and control of load dispatch center.
3. (i) Explain what is EMS? What are its major functions in power system operation and control?

(ii) Design the block diagram to show the hardware configuration of a SCADA system for a power system and explain the application of SCADA in monitoring and control of power system

4. Explain the security monitoring using state estimation with necessary diagrams.
5. (i)Prepare need of computer control of power system.

(ii) Evaluate the major functions of system security control.

6. Show various state transitions and control strategies using state transition diagram.
7. Illustrate the various functions of energy control centre.
8. Explain the various contingencies that are generally considered for steady sate security analysis. Explain the major functions of system security control.
9. Infer short notes on energy control centre EMS and its functions.