MALLA REDDY COLLEGE OF ENGHINEERING AND TECHNOLOGY
ELECTRICAL AND ELECTRONICS ENGINEERING
III B. TECH II SEM (R20)
SUB: POWER SYSTEM OPERATION AND CONTROL

UNIT-1 **QUESTION BANK** **A.Y.:2022-23**

UNIT-1

1. A constant load of 400 MW is supplied by two 200 MW generators 1 & 2 for which the fuel cost characteristics are given as

$$F_1 = 0.05P_{G1}^2 + 20P_{G1} + 30 \ Rs/hr$$

$$F_2 = 0.06P_{G2}^2 + 15P_{G2} + 40 \ Rs/hr$$

The real power generation of units P_{G1} and P_{G2} are in MW and also determine the most economical load sharing between the generators. **14 M**

2. A power system network with a thermal power plant is operating by three generating units. Determine the most economical unit to be committed to a load of 10MW. $F_1 = 20+10P_1+0.001P_1^2$ and $1<P_1<400$, $F_2 = 10+8P_2+0.005P_2^2$ and $1<P_2<4$, $F_3 = 10+6P_3+0.005P_3^2$ and $1<P_3<6$. Where the P_1, P_2 and P_3 are in MW. **14 M**
3. (a)Discuss the relation between voltage and reactive power at a node. **7M**

   (b) A generating unit has two 200MW units whose input cost data is as follows $F1= 0.004P_1^2+2.0P_1+80$ Rs/hr; $F2=0.006P_2^2+1.5P2+100$Rs/hr; for a total load of 250MW, find the load dispatch between the two units for economic operation. **7M**
4. (a) Explain optimum generation allocation including the effect of transmission line losses. **7M**

   (b) the incremental fuel cost of thermal power plant having two units are given by dF1/dP1=0.021P1+4,dF1/dP2=0.024+3.2 for load demand of 180MW.What is the total saving realized against equal distribution of power? **7M**
5. Explain optimal operation of generators in Thermal power stations with example. **7M**
6. List the characteristics of thermal power station and explain it. **7M**
7. Explain the following characteristics of thermal power station. **7M**

   a) Heat rate curve b) Cost curve c) Incremental fuel cost and production cost
8. Explain the input and output characteristics of thermal power station. **7M**
9. Explain the optimum generation allocation including transmission line losses. **7M**

10. Explain the general transmission line loss formula and derive its co efficient. **14M**

11. Three plants of a total capacity of 500 MW are scheduled for operation to supply a total system load of 310 MW. Evaluate the optimum load scheduling if the plants have the following cost characteristics and the limitation. **14M**

12. The incremental cost characteristics of two thermal plants are given by

$$\frac{dC_1}{dP_{G_1}} = 0.2P_{G_1} + 60 \text{ Rs./MWh}$$

$$\frac{dC_2}{dP_{G_2}} = 0.3P_{G_2} + 40 \text{ Rs./MWh}$$

Calculate the sharing of a load of 200 MW for most economic operations. If the plants are rated 150 and 250 MW, respectively, what will be the saving in cost in Rs./hr in comparison to the loading in the same proportion to rating.

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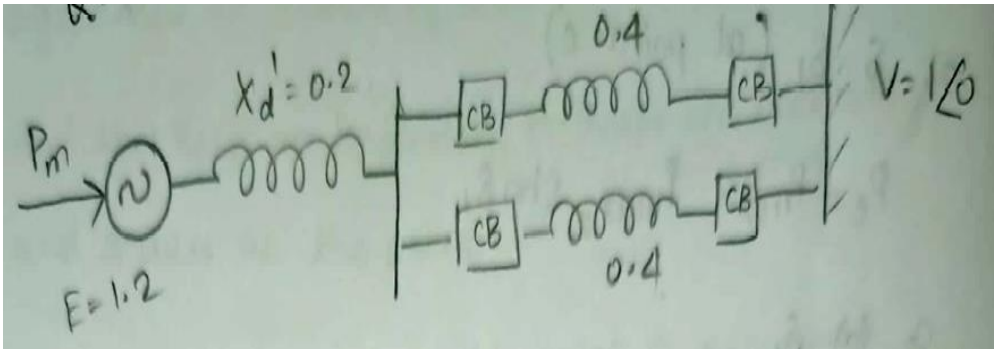
UNIT-2 **QUESTION BANK** **A.Y.:2022-23**

UNIT-2

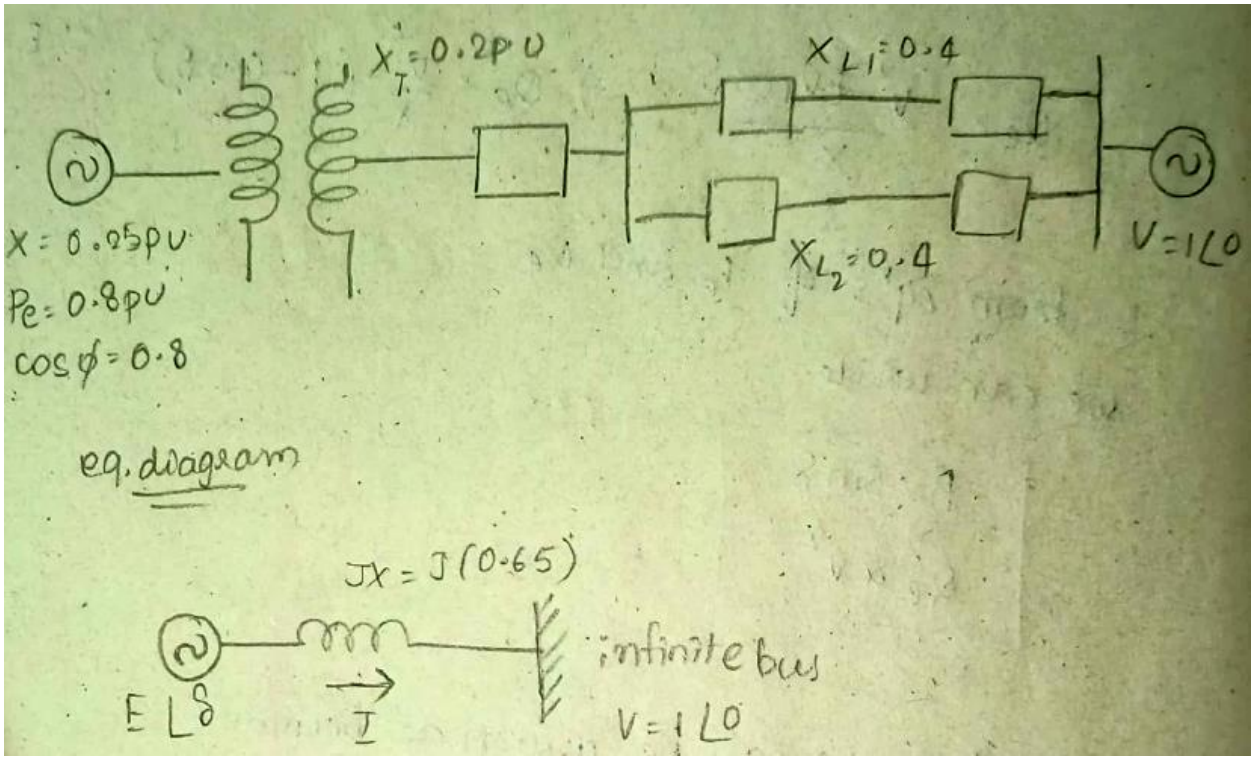
1. Define and explain the statement of unit commitment problem and give its necessity. **14 M**
2. List the constraints of unit commitment and explain it. **14 M**
3. Define and explain spinning reserve, Thermal unit and Hydro constraints. **14M**
4. List the types of Thermal unit constraints and briefly explain it. **7M**
5. List the types of hdro constraints and briefly explain it. **7M**
6. Define unit commitment problem and classify its techniques and explain about dynamic programming method. **14M**
7. What is dynamic programming and explain the procedure for preparing the UC table by using the DP approach. **14M**
6. A power system network with a thermal power plant is operating by four generating units. Determine the most economical unit to be committed to a load demand of 8MW also prepare the UC table for the load changes in steps of 1 MW starting from the minimum to maximum load. The minimum and maximum generating capacities and cost curve parameters of the units listed in a tabular form given in table. **14M**

Unit number	Capacity (MW)		Cost-curve parameters		
	Min.	Max.	a	b	d
1	1.0	14.0	0.74	22.9	0
2	1.0	14.0	1.56	25.9	0
3	1.0	14.0	1.97	29.0	0
4	1.0	14.0	1.36	31.2	0

7. What is meant by power system stability and explain about steady state stability and transient stability. **14M**
8. Explain the power angle equation and derive the equation for active power and reactive power. **14M**
9. Explain the swing equation and discuss its application in the study of power system stability. **14M**
10. Explain the equal area criterion of stability in connection to one machine is connected to infinite bus. **14M**
11. Explain the equal area criterion of stability in application to sudden increase in mechanical input. **14M**
12. Explain the concept of factors affecting the transient stability. **14 M**
13. For a system shown in figure, the P.U values for different quantities are E=1.2, V=1, $X_d^{'} = 0.2\ P.U,\ X_1 = X_2 = 0.4\ p.u.$ The system is operating at equilibrium point with $P_{mo} = 1.5\ P.U$. When one of the line is suddenly switched off. Predict whether the system is stable or not. If the system is stable, find the maximum value of δ. **14M**



14. In the single machine is connected to infinite bus shown in below, the generator is delivering the real of 0.8 p.u at 0.8 p.f lagging to the infinite bus. The power angle of the generator in degrees is? **14M**



15. An alternator is connected to infinite bus as shown in figure. It delivers 1.0 p.u at 0.8 p.f lagging at v = 1.0 p.u. The reactance Xd of the alternator is 1.2 p.u. determine the active power output and the steady state power limit. Keeping the active power fixed, if the excitation is reduced. Find the critical excitation corresponding to operation at stability limit. **14M**

16. A generator supplies 50MW to an infinite bus. The maximum power of the system P_{max} = 100MW. Determine whether generator will remain synchronous of the mechanical input to the generator i.e., P_m suddenly increased by 30MW. **14M**

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UNIT-3 **QUESTION BANK** **A.Y.:2022-23**

UNIT-3

1.	Derive the transfer function model of a speed governing system and represent it by a block diagram.	**14 M**
2.	With a neat diagram explain briefly different parts of turbine speed governing system?	**14 M**
3.	Explain the functioning of speed governing system and obtain its necessary mathematical modeling with neat diagram.	**14 M**
4.	Discuss the main parts of speed governing system with a neat diagram.	**14 M**
5.	Derive and explain the small signal transfer function of steam turbine system.	**14 M**
6.	With a neat diagram derive and explain the modeling of a steam turbine.	**14 M**
7.	With a neat diagram explain first order steam turbine models with reheat and non reheat type construction.	**14 M**
8.	Derive and explain the reheat type steam turbine model.	**7 M**
9.	With a neat diagram explain the first order turbine model with non heat type construction.	**7 M**
10.	What is net surplus power and explain its types.	**14 M**
11.	Derive and explain the modeling of a generator load model.	**14 M**
12.	Derive and explain the transfer function of a generator load model.	**14M**

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UNIT-4 **QUESTION BANK** **A.Y.:2022-23**

UNIT-4

1. What is the necessity of keeping frequency as constant and explain it. **7 M**
2. What is control area and explain the single area control block diagram representation of an isolated power system. **14 M**
3. Explain the single area control block diagram representation of an isolated power system. **7 M**
4. With a neat diagram explain the single area control block diagram representation of an isolated power system. **7 M**
5. Draw the transfer function block diagram model of load frequency control of an isolated power system and explain it. **7 M**
6. Illustrate about the Static analysis of un-controlled case single area load frequency control. **14 M**
7. Explain the steady state analysis of un-controlled case of single area load frequency control. **14 M**
8. Draw the transfer function block diagram model of steady state analysis single area load frequency control for un-controlled case and explain it. **14 M**
9. Illustrate about the Static analysis of controlled case single area load frequency control. **14 M**
10. Explain the steady state analysis of controlled case of single area load frequency control. **14 M**
11. Draw the transfer function block diagram model of steady state analysis single area load frequency control for controlled case and explain it. **14 M**
12. Illustrate about the Static analysis of un-controlled and controlled case single area load frequency control. **14 M**
13. Explain the steady state analysis of un- controlled and controlled case of single area load frequency control. **14 M**
14. Draw the transfer function block diagram model of steady state analysis single area load frequency control for un-controlled and controlled case and explain it. **14 M**
15. Illustrate about the dynamic analysis of un-controlled case single area load frequency control. **14 M**

16. Explain the dynamic analysis of un-controlled of single area load frequency control. **14 M**
17. Draw the transfer function block diagram model of dynamic analysis single area load frequency control for un-controlled case and explain it. **14M**
18. Explain the concept of control area. Develop a state space representation of two area control system for un-controlled case. **14 M**
19. Explain two area load frequency control with its block diagram and also derive expressions for un-controlled case. **14 M**
20. Draw the transfer function block diagram model of steady state response two area load frequency control for un-controlled case and explain it. **14M**
21. Explain the concept of control area. Develop a state space representation of two area control system for controlled case. **7M**
22. Explain two area load frequency control with its block diagram and also derive expressions for controlled case and derive the expressions for area control error. **7M**
23. Draw the transfer function block diagram model of steady state response two area load frequency control for controlled case and explain it. **7M**
24. Explain two area load frequency control with its block diagram and also derive the expression for tie-line bias control and area control error. **14M**
25. Illustrate how to integrate economic dispatch control with load frequency control. **14M**
26. Explain Proportional plus Integral control of single area and its block diagram representation with a neat transfer function diagram. **7M**

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UNIT-5 **QUESTION BANK** **A.Y.:2022-23**

UNIT-5

1.	What is the necessity of Reactive Power control in power system?	**7 M**
2.	Explain the concept of reactive power compensation in transmission system.	**7 M**
3.	What is reactive power and explain the importance of reactive power compensation in transmission system.	**7 M**
4.	With a neat diagram discuss the reactive power compensation in transmission system.	**7 M**
5.	Define reactive power and explain the concept of reactive power compensation at generation, middle of transmission and near to the load with a suitable diagram.	**14M**
6.	Distinguish the advantages and disadvantages of different types of compensating equipment for transmission systems.	**14 M**
7.	Explain the differences of different types of compensating equipment for transmission system.	**14 M**
8.	Explain the advantages and disadvantages of different types of compensating equipment for transmission systems.	**14 M**
9.	What is load compensation and list the specifications of load compensator.	**7 M**
10.	Define load compensation and explain the specifications of load compensator.	**14 M**
11.	Make use of suitable diagram and explain the Uncompensated and compensated transmission lines.	**14 M**
12.	Explain the Uncompensated and compensated transmission lines in case of shunt, series and Synchronous compensation.	**14 M**
13.	Distinguish the Uncompensated and compensated transmission lines for shunt, series and Synchronous compensation.	**14 M**
14.	Justify the concept of Receiving end power circle diagrams how it is applicable to receiving end transmission line.	**14 M**

15. Explain the concept of Receiving end power circle diagrams and derive the equation for receiving end power. **14 M**
16. What is the necessity of receiving end power circle diagram in power system? **7M**
17. List the methods of voltage control with a neat diagram explain the tap setting OLTC transformer. **14 M**
18. What is tap setting transformer? Classify and explain it with a suitable diagram. **14 M**
19. How the turns ratio is differ in tap changing transformer explain it by a suitable diagram. **14M**
20. What are the various methods for voltage control and list the applications of tap changing transformer. **7M**