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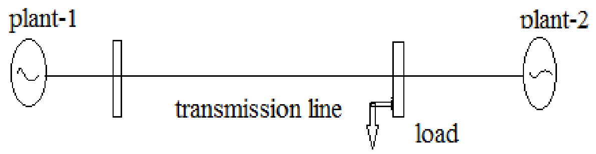
QUESTION BANK (DESCRIPTIVE)

Subject with Code : PSOC(**19EE0217**) **Course & Branch**: B.Tech - EEE

Year & Sem: III-B.Tech & II-Sem **Regulation:** R19

UNIT –I
ECONOMIC OPERATION

1	a	Briefly explain about an incremental fuel cost of thermal power station.	[L2][CO1] [4M]
	b	The fuel cost of two units are given by, $C_1=1.5+20P_{G1}+0.1P_{G1}^2$ Rs/hr, $C_2=1.9+30P_{G2}+0.1P_{G2}^2$ Rs/hr. If the total demand on the generation is 200MW, find the economic load scheduling of the two units	[L3][CO1][8M]
2		The fuel inputs per hour of plants 1 and 2 are given as $F_1=0.2P_1^2+40P_1+120$ Rs/hr, $F_2=0.25P_2^2+30P_2+150$ Rs/hr. Determine the economic operating schedule and the corresponding cost of generation if the maximum and minimum loading on each unit is 100MW and 25MW, the demand is 180MW, and transmission losses are neglected. If the load is equally shared by both units, determine the saving obtained by loading the units as per equal incremental production cost.	[L3][CO1][12M]
3	a	Explain about penalty factor.	[L1][CO1][4M]
	b	A power plant has 3 units with the following characteristics, $F_1=0.05P_1^2+21.5P_1+800$ Rs/hr ,$F_2=0.10P_2^2+27.0P_2+500$Rs/hr, $F3=0.07P_3^2+16.0P_3+900$Rs/hr. P_{max}=120MW and P_{min}=39MW. Find the optimum scheduling and the total cost per hour for a total load of 200MW.	[L3][CO1][8M]
4		A system consists of two power plants connected by transmission line. The total load located at plant-2 is as shown in figure. Data of evaluating loss coefficients consist of information that a power transfer of 100 MW from station-1 to station-2 results in a total loss of 8 MW. Find the required generation at each station and power received by the load when λ of the system in Rs.100/Mwh. The IFCs of the two plants are given by $\frac{dC_1}{dP_{G1}} = 0.12\,P_{G1} + 65$ Rs/MWh. $\frac{dC_2}{dP_{G2}} = 0.25\,P_{G2} + 75$ Rs/MWh	[L3][CO1][12M]



When 212.5MW received by the load, find the savings in Rs/hr obtained by co-coordinating the transmission losses rather than neglecting in determining the load division between the plants.

5		Derive and explain the general transmission loss formula.	[L3][CO1][12M]
6		The fuel cost curve of two generators are given as $C_1=0.06P_1^2+35P_1+625$ Rs/hr, $C_2=0.05P_2^2+30P_2+175$ Rs/hr. If the total load supplied is 550MW, find the optimal dispatch with and without considering the generator limits: $35MW< P_1<175MW$, $35MW< P_2<600MW$ and also comment about the incremental cost of both cases.	[L3][CO1][12M]
7	a	Define objective function	[L1][CO1][2M]
	b	Explain about optimum generation allocation with line loss neglected	[L2][CO1][10M]
8		Develop the loss coefficients formula for a three plant system and power loss equation	[L3][CO1] [12M]
9		Explain about generation allocation including the effect of transmission line loss	[L2][CO1][12M]
10		(i)Define the incremental efficiency	[L1][CO1][2M]
		(ii) Write the exact co-ordination equation	[L2][CO1][2M]
		(iii) List the state variables	[L1][CO1][2M]
		(iv) Define and draw the production cost	[L1][CO1][2M]
		(v) Define loss coefficients	[L1][CO1][2M]
		(vi) Draw input-output characteristics curve	[L1][CO1][2M]
		(vii) What are the assumptions for deriving the loss coefficients	[L1][CO1][2M]
		(viii) Write the separable objective function and why it is called so?	[L1][CO1][2M]
		(ix) Define and draw the Heat rate curve	[L1][CO1][2M]
		(x) Define control variables	[L1][CO1][2M]
		(xi) What are the equality and inequality constraints in case of transmission losses are neglected?	[L1][CO1][2M]

UNIT –II

HYDRO-THERMAL SCHEDULING

1	a	With neat figure explain the classification of hydro power plant	[L2][CO2][8M]
	b	What is the necessity of connecting two different plants on same load?	[L1][CO2][4M]
2		Derive solution for short term hydro-thermal scheduling using kirchmayer's method.	[L3][CO2][12M]
3	a	Explain about hydro – thermal co-ordination with necessary equations.	[L2][CO2][6M]
	b	The following incremental costs pertain to a 2 plant system. $\frac{dF_1}{dP_1}=0.03P_1+14$ Rs/MWhr, $\frac{dF_2}{dP_2}=0.04P_2+10$ Rs/MWhr. The loss coefficient are B_{11}=0.001(MW)$^{-1}$. $B_{12}=B_{22}=0$. If λ for the system is Rs.30/MWhr compute the required generation at the plants and the loss in the system	[L3][CO2][6M]
4	a	How the problems of scheduling Hydro-thermal power plants are classified?	[L1][CO2][6M]
	b	A system consists of two generators with the following characteristics	[L1][CO2][6M]

$$F_1=(7P_1+0.03P_1^2+70)10^6$$

$$F_2=(5P_2+0.05P_2^2+100)10^6$$

Where F and P are fuel input in K-cal/hr and unit output in MW respectively. The daily load cycle is given as follows,

Time	Load
12 midnight to 6 am	50MW
6 am to 6 pm	150MW
6 pm to 12 midnight	50MW

Give the economic schedule for the three periods of the day.

5 Derive the general mathematical formulation of long term hydro thermal scheduling [L2][CO2][12M]

6 The incremental production cost data of two plants are $\frac{dF_1}{dP_1}=2+P_1$ and $\frac{dF_2}{dP_2}=1.5+P_2$ where p1 and p2 are expressed in per unit on 100MVA base. Assume that both the units are in operation and that the maximum loading of [L3][CO2][12M]

each unit is 100MW and the minimum loading of each unit is 10MW. The loss coefficients on a 100MVA base are given by

$$B = \begin{vmatrix} 0.10 & -0.05 \\ -0.05 & 0.2 \end{vmatrix}$$

For λ=2.5 solve the coordination equations, by the iterative method.

7		Derive the mathematical formulation of hydro-thermal scheduling.	[L3][CO2][12M]
8		Briefly explain about short term problem in hydrothermal scheduling.	[L2][CO2][12M]
9	a	What is inter connected grid system?	[L1][CO1][6M]
	b	Consider a steam station with two units the input-output characteristics being specified by F1=80+8P1+0.024P12 F2=120+6P2+0.04P22 In scheduling a load of 100MW by equal incremental cost method, the incremental cost of unit 1 is specified wrongly by 10% more than the true value while that of unit 2 is specified by 6% less than the true value Find (i) The change in generation schedules and (ii) The change in the total cost of generation.	[L3][CO2][6M]
10	a	Explain in detail about long term co-ordination.	[L2][CO2][8M]
	b	Explain about conventional plants in detail	[L2][CO2][4M]

UNIT –III

MODELING OF TURBINE AND GOVERNER

1		Explain turbine models for steam power plants with neat diagram.	[L2][CO3][12M]
2	a	Explain the functions of flyball speed governor and hydraulic amplifier in speed governing system.	[L2][CO3][6M]
	b	Discuss about transfer functions of reheat and non – reheat turbine.	[L2][CO3][6M]
3	a	Draw the block diagram of steam turbine and explain it in detail	[L1][CO3][6M]
	b	A 100 MVA synchronous generator operates on full load at a frequency of 50 Hz. The load is scheduled to 50 MW. Due to time lag in the governor system, the steam valve begins to close after 0.4 seconds. Determine the change in frequency that occurs in this time. M = 5 KW-S/KVA of generator capacity	[L3][CO3][6M]
4		Two generating stations A and B have full load capacities of 200MW and 75MW respectively. The inter connector connecting the two stations has an induction motor /synchronous generator (plant C) of full load capacity 25MW near station. A percentage changes of speed of A,B and C are 5 ,4 and 3 respectively. The loads on bus bars A and B are 75MW and 30MW respectively. Determine the load taken by the set C and indicate the direction of power flow	[L3][CO3][12M]
5		Two generator rated 200MW and 400MW are operating in parallel. The droop characteristics of their governors are 4% and 5% respectively from no load to full load. Assuming that the generators are operating at 50HZ at no load, how would a load of 600MW be shared between them? What will be the system frequency at this load? Assume free governor operation. Repeat the problem if the both governors have droop of 4%.	[L2][CO3][12M]
6		What are the parts of speed governor system? Explain each part with neat sketch	[L1][CO3][12M]
7		Derive the mathematical modeling of speed governor system	[L3][CO3][12M]
8		Two turbo alternators rated for 110MW and 210MW, have governor drop characteristics of 5% from no load to full load. They are connected in parallel to share a load of 250MW. Determine the load shared by each machine assuming free governor action	[L3][CO3][12M]

9	a	Explain about first order turbine model.	[L2][CO3][7M]
	b	Sketch the schematic diagram of speed governor system.	[L3][CO3][5M]
10		Derive and explain the mathematical modeling of speed governing system	[L3][CO3][12M]

UNIT –IV

LOAD FREQUENCY CONTROL

1		Draw the block diagram representation of a single area system and deduce the expression for the steady state response of the system.	[L1][CO4][12M]
2	a	Why frequency of the power system should be kept constant?	[L4][CO4][6M]
	b	A 500MW generator has a speed regulation of 4%. If the frequency drops by 0.12Hz with an unchanged reference, determine the increase in turbine power. And also find by how much the reference power setting should be changed if the turbine power remain unchanged.	[L3][CO4][6M]
3		The following data is available for an isolated area, capacity 4000MW, frequency 50Hz, operating load 2500MW, speed regulation constant 2Hz/puMW. Intertia constant=5sec. 2% of change in load takes place for 1% change in frequency. Find a) Large change in step load if steady state frequency is not exceed by more than 0.2Hz. b) Change in frequency as a function of time after a step change in load.	[L3][CO4][12M]
4	a	Explain about load frequency control and economic dispatch control.	[L2][CO4][10M]
	b	Define control area	[L1][CO4][2M]
5		Give typical block diagram for a two-area system inter connected by tie line and explain each block	[L2][CO4][12M]
6		Two interconnected area 1 and area 2 have the capacity of 2000 and 500MW respectively. The incremental regulation and damping torque coefficient for each area on its own base are 0.2pu and 0.8pu respectively. Find the steady state change in system frequency from a nominal frequency of 50Hz and the change in steady state tie line power following a 750MW change in the load of area 1	[L3][CO4][12M]
7		Explain the proportional plus integral control for load frequency control of single area system	[L2][CO4][12M]
8	a	Discuss in detail the importance of load frequency control.	[L2][CO4][6M]
	b	Derive the expression for dynamic response of isolated power system under uncontrolled case.	[L3][CO4][6M]

9	a	Explain the multi control area systems.	[L1][CO4][5M]
	b	Two generating units having the capacities 600 and 900MW operating at a 50Hz supply. The system load increases by 150MW when both the generating units are operating at about half of their capacity which results in the frequency falling by 0.5Hz. If the generating units are to share the increased load in proportion to their ratings. What should be the individual speed regulations? What should the regulation to be expressed in PU Hz/ PU MW.	[L1][CO4][7M]
10		Explain about of tie-line bias control with neat sketch	[L2][CO4][12M]

UNIT –V

REACTIVE POWER CONTROL AND POWER SYSTEM RESTRUCTURING

1	a	Describe about the series compensation in transmission line	[L2][CO5][6M]
	b	A short transmission line has an impedance of (2+j3) ohms interconnects two power stations, A and B both operating at 11 KV, equal in magnitude and phase. To transfer 25 MW at 0.8 p.f. lagging from A to B determine the voltage boost required at plant A.	[L3][CO5][6M]
2		Explain clearly what do mean by compensation of a transmission line and discuss briefly different methods of compensation	[L2][CO5][12M]
3		What are the different types of compensating equipment used for transmission systems. Explain all in detail	[L1][CO5][12M]
4		A load of (15+j10)MVA is supplied with power from a generating station from a line at 110KV 3 phase 50HZ. The line is 100Km length. The line is represented by π model with the parameters- R=26.4ohms, X=33.9ohms, $B=219*10^{-6}$ voltage at the generated in 116KV. Determine the power supplied by the generating station	[L3][CO5][12M]
5		List the types of reactive power compensation. Briefly describe about load power compensation with necessary equations	[L1][CO5][12M]
6	a	What are the advantages and disadvantages of different types of compensating equipment for transmission systems?	[L1][CO6][7M]
	b	Explain about static var compensators.	[L2][CO5][5M]
7		Two substation A and B are interconnected by a line having an impedance of (0.03+j0.12)pu the substation voltages are $33<2^0$ KV and $33<0^0$ KV respectively. In phase and quadrature boosters are installed at A. Determine their output-voltage ratings and MVA ratings in order to supply 5MVA at 0.8pf lagging at substation B.	[L3[CO5][12M]
8	a	Distinguish shunt and series compensations.	[L2][CO5][6M]
	b	List the specifications of load compensation.	[L1][CO5][6M]
9	a	Explain the limitations of series compensation.	[L2][CO5][6M]
	b	What is surge impedance loading and also derive the necessary equations	[L1][CO5][6M]
10		Explain the motivation for restructuring power system.	[L2][CO6][12M]