INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad-500043

ELECTRICAL AND ELECTRONICS ENGINEERING

TUTORIAL QUESTION BANK

<table>
<tr><td>Course Title</td><td colspan="5">POWER SYSTEM OPERATION AND CONTROL</td></tr>
<tr><td>Course Code</td><td colspan="5">AEE016</td></tr>
<tr><td>Programme</td><td colspan="5">B.Tech</td></tr>
<tr><td>Semester</td><td>VII</td><td colspan="4">EEE</td></tr>
<tr><td>Course Type</td><td colspan="5">Core</td></tr>
<tr><td>Regulation</td><td colspan="5">IARE - R16</td></tr>
<tr><td rowspan="3">Course Structure</td><td colspan="3">Theory</td><td colspan="2">Practical</td></tr>
<tr><td>Lectures</td><td>Tutorials</td><td>Credits</td><td>Laboratory</td><td>Credits</td></tr>
<tr><td>3</td><td>1</td><td>4</td><td>-</td><td>-</td></tr>
<tr><td>Chief Coordinator</td><td colspan="5">Mr. A Sathish Kumar, Assistant Professor</td></tr>
<tr><td>Course Faculty</td><td colspan="5">Mr. A Sathish Kumar, Assistant Professor</td></tr>
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COURSE OBJECTIVES:

The course should enable the students to:	
I	Demonstrate economic operation of power systems, hydrothermal scheduling.
II	Illustrate modelling of turbines, generators and automatic controllers.
III	Discuss single area and two area load frequency control.
IV	Analyze reactive power control and load modeling

COURSE OUTCOMES (COs):

CO 1	Understand the optimal operation of generators in thermal power stations and their characteristics with and without transmission loss coefficient
CO 2	Design the mathematical models of the speed governing systems, turbine and excitation system.
CO 3	Discuss single area load frequency control and two area load frequency control.
CO 4	Discuss the need of power factor correction and voltage drop compensation and Identify the best methods for power factor improvement and voltage control.
CO 5	Understand the types of loads and their characteristics with specifications of load compensator.

COURSE LEARNING OUTCOMES (CLOs):

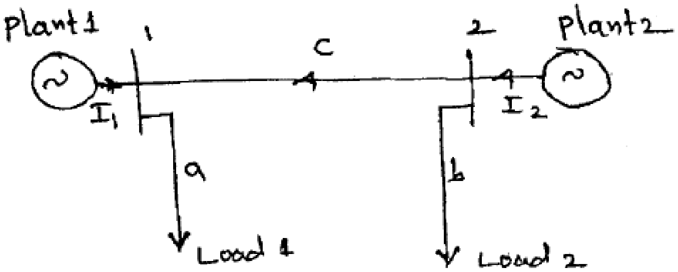
AEE016.01	Understand optimal operation of generators in thermal power stations and their characteristics
AEE016.02	Design an optimal operation setup of power system which minimizes operation costs and meet desired needs.
AEE016.03	Solve the unit Commitment problem with various constraints using conventional optimization techniques and general transmission line loss formula
AEE016.04	Examine optimal scheduling of hydrothermal system characteristics and their economic operation.
AEE016.05	Design the mathematical models of the mechanical and electrical components involved in the operation of power systems
AEE016.06	Understand the modeling of excitation systems and fundamental characteristics of an excitation system
AEE016.07	Design the single area and two area thermal power system.
AEE016.08	Demonstrate the understanding of the open loop and closed loop control practices associated with the voltage and frequency control of single area or interconnected multi area power systems
AEE016.09	Understand the significance of reactive power control in power systems to maintain quality of power
AEE016.10	Design appropriate control scheme to compensate reactive power
AEE016.11	Describe the different methods of control and compensation to choose the best option so that social and environmental problems are minimized
AEE016.12	Describe the different methods of control and compensation recognize the need to continuously follow the advancements in technology and incorporate them in the present system to improve efficiency and increase the flexibility and quality of operation
AEE016.13	Differentiate the types of loads and their characteristics
AEE016.14	Calculate the voltage drop and power loss in a distribution system.
AEE016.15	Apply the concept of power systems and operation and control to solve real time world applications
AEE016.16	Explore the knowledge and skills of employability to succeed in national and international level competitive examinations

TUTORIAL QUESTION BANK

	UNIT- I			
ECONOMIC OPERATION OF POWER SYSTEMS				
Part - A (Short Answer Questions)				
S No	**QUESTIONS**	**Blooms Taxonomy Level**	**Course Outcomes**	**Course Learning Outcomes (CLOs)**
1	Define in detail the following? i. Control variables ii. Disturbance variables iii. State variables.?	Remember	CO 1	AEE016.01
2	Draw incremental fuel cost curve ?	Understand	CO 1	AEE016.01
3	What is Production cost of power generated and incremental fuel rate?	Remember	CO 1	AEE016.02
4	Write the expression for hourly loss of economy resulting from error in Incremental cost representation?	Remember	CO 1	AEE016.02
5	List out the methods of scheduling of generation of steam plants?	Remember	CO 1	AEE016.03
6	Draw flow chart for economic scheduling without considering line losses.	Remember	CO 1	AEE016.03
7	What is the role of spinning reserve in unit commitment?	Remember	CO 1	AEE016.03
8	Write the equality and inequality constraints considered in the economic dispatch problem	Remember	CO 1	AEE016.03
9	Define ‘‘Load Curve’’?	Remember	CO 1	AEE016.03
10	What are the requirements of control strategy in integral control?	Remember	CO 1	AEE016.03
11	What is long-term hydrothermal scheduling?	Remember	CO 1	AEE016.04
12	What is meant by scheduled reserve?	Remember	CO 1	AEE016.03
13	Write the equality and inequality constraints considered in the economic dispatch problem?	Understand	CO 1	AEE016.02
14	Write transmission loss formula in terms of B- coefficients	Understand	CO 1	AEE016.02
15	Define Heat rate and cost curve	Remember	CO 1	AEE016.02
16	Define generation cost and production cost.	Understand	CO 1	AEE016.02
Part - B (Long Answer Questions)				
1	Describe in detail, with suitable examples, the methods of optimum scheduling of generation of power from a thermal station.	Understand	CO 1	AEE016.02
2	Derive transmission loss formula in terms of B- coefficients	Understand	CO 1	AEE016.02
3	Explain in detail the terms production costs, total efficiency, incremental efficiency and incremental rates with respect to a thermal power plant .	Understand	CO 1	AEE016.02
4	Give various uses of general loss formula and state the assumptions made for calculating B_{mn} coefficients.	Understand	CO 1	AEE016.02
5	Give step by step procedure for computing economic allocation of generation in a thermal station.	Understand	CO 1	AEE016.02
6	What is the objective in economic load scheduling? Describe the need for co ordination of different power station.	Understand	CO 1	AEE016.03
7	The fuel cost for a two unit steam power plant are given by $C1 = 0.1 P1^2 + 25 P1 + 1.6$ Rupees/hour $C2 = 0.1 P_2^2 + 32 P2 + 2.1$ Rupees/hour Where p's are in megawatt. If there is an error of 1% in the representation of the input data, and the loss in operating economy for a load of 250 MW.	Understand	CO 1	AEE016.03
8	A power System consists of two, 125 MW units whose input cost data are represented by the equations : $C1 = 0.04 P_1^2 + 22 P_1 + 800$ Rupees/hour $C2 = 0.045 P_2^2 + 15 P_2 + 1000$ Rupees/hour If the total received power PR = 200 MW. Determine the load sharing between units for most economic operation.	Understand	CO 1	AEE016.03
9	100 MW, 150 MW and 280 MW are the ratings of three units located in a thermal power station. Their respective incremental costs are given by the following equations:	Understand	CO 1	AEE016.03

	dc1/dp1 = Rs(0.15p1 + 12); dc3/dp3 = Rs(0.21p3 + 13) dc2/dp2 = Rs(0.05p2 + 14) Where P1, P2 and P3 are the loads in MW. Determine the economical load allocation between the three units, when the total load on the station is 300 MW.			
10	What is mean by unit commitment problem? Discuss a method for solving the same.	Understand	CO 1	AEE016.03
11	Explain the various factors to be considered in allocating power generation to different power station s for optimum operation.	Understand	CO 1	AEE016.03
12	Give algorithm for economic allocation of generation among generators of a thermal system taking into account transmission losses. Give steps for implementing this algorithm and also derive necessary equations.	Understand	CO 1	AEE016.03
13	Write a short notes on: a) Inequality constraints. b) Penalty function.	Understand	CO 1	AEE016.03
14	What are the methods of scheduling power generation of steam plants? Explain their merits and demerits?	Understand	CO 1	AEE016.03
15	Discuss optimal power flow problems without and with inequality constraints. How are these problems solved?	Understand	CO 1	AEE016.03
16	Develop loss formula coefficients for a two plant system. State the assumption made?	Understand	CO 1	AEE016.03
17	Explain the problem of scheduling hydro thermal power plants. What are the constraints in the problem?	Understand	CO 1	AEE016.03
18	Explain clearly the mathematical formulation of optimal scheduling of hydrothermal system with a typical example.	Understand	CO 1	AEE016.04
19	Derive general mathematical formulation of long term hydro thermal scheduling.	Understand	CO 1	AEE016.04
20	State what is mean by base and peak load stations. Discuss the combined hydroelectric and steam station operation.	Understand	CO 1	AEE016.04
Part - C (Problem Solving and Critical Thinking Questions)				
1	Incremental fuel cost is Rs/MWhr for a plant of a two units. dc1/dpg1=0.25 pg1+40; dc2/dpg2=0.3 pg2+30 Assume that both the units are operating at all times and total load varies from 40 MW to250 MW. How will the load be shared for a load of 200 MW? What is the corresponding value of plant incremental cost? Also determine the saving in the fuel cost in Rs/hr for one optimum scheduling of 250 MW as compared to equal distribution of same load between two plants.	Understand	CO 1	AEE016.02
2	The incremental fuel cost in rupees per MWhr for a plant consisting of two units are dC1/dPG1 =0.20 PG1+40.0; dC2/dPG2 =0.25 PG2+30.0 Assume that both units are operating at all times and total load varies from 40 MW to 250 MW and maximum and minimum loads on each unit are to be 125 MW and 20MW respectively .How will the load be shared between the units as the system varies over full range? What are the plant incremental costs?	Understand	CO 1	AEE016.02
3	The fuel inputs per hour of plants 1 and 2 are given as F1 =0.2 P1 2+40 P1+120 Rs per hr. F2 =0.25 P^2_2+30 P2+150 Rs per hr. Determine the economic operating schedule and the corresponding cost of generation if the maximum and minimum loading on each unit is 100 MW and 25 MW,the demand is 180 MW and transmission losses are neglected. If the load is equally shared by both the units, determine the saving obtained by loading the units as per the incremental production cost.	Understand	CO 1	AEE016.02
4	Let us consider a generating station that contains a total number of three generating units. The fuel costs of these units are given by	Understand	CO 1	AEE016.03

	$f_1 = \frac{0.8}{2}P_1^2 + 10P_1 + 25$ Rs./h $f_2 = \frac{0.7}{2}P_2^2 + 5P_2 + 20$ Rs./h $f_3 = \frac{0.95}{2}P_3^2 + 15P_3 + 35$ Rs./h The generation limits of the units are $30\,\text{MW} \le P_1 \le 500\,\text{MW}$ $30\,\text{MW} \le P_2 \le 500\,\text{MW}$ $30\,\text{MW} \le P_3 \le 250\,\text{MW}$ The total load that these units supply varies between 90 MW and 1250 MW. Assuming that all the three units are operational all the time, we have to compute the economic operating settings as the load changes.			
5	Consider two generating plant with same fuel cost and generation limits. These are given by $f_i = \frac{0.8}{2}P_i^2 + 10P_i + 25\ \text{Rs./h} \quad i = 1,2$ $100\,\text{MW} \le P_i \le 500\,\text{MW}, \quad i = 1,2$ For a particular time of a year, the total load in a day varies as shown in Fig. 5.2. Also an additional cost of Rs. 5,000 is incurred by switching of a unit during the off peak hours and switching it back on during the during the peak hours. We have to determine whether it is economical to have both units operational all the time	Understand	CO 1	AEE016.03
6	The fuel inserts per all of plants I and II are given as F_1= 0.1P^2_1 + 40 P_1+120 Rs/Hr F_2= 0.25P $^2{}_2$+30P_2+150 Rs/Hr. Determine the economic operating schedule and corresponding cost of generation if the max and min loading on each unit is 100 MW and 25 MW and the demand is 180 MW and transmission losses are neglected. If the load is equally shared by the both the units, determine the saving obtained by loading the units as per equal incremental products and cost.	Understand	CO 1	AEE016.03
7	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 8 MW. Also prepare the UC table for the load. The min and max generating capacities and cost curve parameters of the units listed in a tabular form are given.	Understand	CO 1	AEE016.03
8	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 10 MW. Also prepare the UC table for the load changes in steps of 1 MW starting from the min and max generating capacities and cost curve parameters of the units listed in a tabular form are given.	Understand	CO 1	AEE016.03
9	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 20 MW. Also prepare the UC table for the load changes in steps of 4 MW starting from the min and max generating capacities and cost curve parameters of the units listed in a tabular form are given.	Understand	CO 1	AEE016.03
10	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 30 MW. Also prepare the UC table for the load changes in steps of 8 MW starting from the min and max generating capacities and cost curve parameters of the units listed in a tabular form	Understand	CO 1	AEE016.03

	are given.			
11	For the system shown in figure, with bus 1 as reference bus with a voltage of 1.0V<00 pu, find the loss formula co-efficient if the branch currents and impedances are: Ia=1.00+j0.15 p.u; Za=0.02+j0.15 p.u Ic =0.20-j0.05pu; Zc =0.02+0.25pu If the base is 100 MVA, what will be the magnitudes of B –coefficients in reciprocal MW?  	Understand	CO 1	AEE016.03
12	The fuel cost functions in Rs/hr for two thermal plants are given by $C_1 =420+9.2P_1+0.004P^2_2$; $C_2=350+8.5P_2+0.0029P^2_2$ Where P1, P2 are in MW. Determine the optimal scheduling of generation if the load is 640.82 MW. Estimate value of ʎ=12 Rs/MWhr. The transmission power loss is given by the expression $P_{L(p.u)} =0.0346P^2_{1(p.u)} +0.00643P^2_{2(p.u)}$	Understand	CO 1	AEE016.03
13	The fuel cost functions in Rs/hr for two thermal plants are given by $C_1 =420+9.2P_1+0.004P^2_{2,}$ $100<P_2<200$; $C_2=350+8.5P_2+0.0029P^2_2$, $150<P_3<500$ Where P1, P2 are in MW. Determine the optimal scheduling of generation if the load is 640.82 MW. Estimate value of ʎ=12 Rs/MWhr. The transmission power loss is given by the expression $P_{L(p.u)} =0.0346P^2_{1(p.u)} +0.00643P^2_{2(p.u)}$	Understand	CO 1	AEE016.03
14	The IFC for two plants are $dC_1/dP_{G1}=0.075$ Pg1+18 Rs/hr; $dC2/dP_{G2}=0.08P_{G2}+16$ Rs/hr The loss coefficients are given as $B_{11}=0.0015$/MW, $B_{12}= -0.00004$/ MW, $B_{22} = 0.0032$/ MW for ʎ=25 Rs/MWhr. Find the real power generations, total load demand, and the transmission power loss.	Understand	CO 1	AEE016.03
15	A system consists of two power plants connected by a transmission line. The total load located at a plant-2 is as shown in below. Data of evaluating loss coefficients consists 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 ʎ of the system is Rs. 100/MWhr. The IFCs of the two plants are given by $dC_1/dP_{G1}=0.12P_{G1}+65$ Rs/MWhr ; $dC_2/dP_{G2}=0.25P_{G2}+75$ Rs/MWhr	Understand	CO 1	AEE016.03
16	For above problem with 212.5 MW 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	Understand	CO 1	AEE016.03
17	Determine the incremental cost of received power and the penalty factor of the plant shown, if the incremental cost of production is $dC_1/dP_{G1}=0.1P_{G1}+3.0$ Rs/MWhr.	Understand	CO 1	AEE016.03
18	Assume that the fuel input in Btu per hour for units 1 and 2 are given by $C_1 =(8P_{G1}+0.024P^2_{G2}+80)10\^6$; $C_2=6P_{G!}+0.04P^2_{G2}+120)10\^6$ The maximum and min loads on the units are 100 and 10 MW, respectively. Determine the min cost of generation when the following load is supplied. The cost of fuel is Rs.2 per million Btu.	Understand	CO 1	AEE016.03
19	Two power plants are connected together by a transmission line and load at plant-2. When 100 MW is transmitted from plant-1, the transmission loss is 100 MW. The cost characteristics of two plants are $C_1 =0.05P^{\backslash 2}_{G1}+13P_{G1}$; $C_2=0.06P^2_{G2}+12P_{G2}$ Find the optimum generation for ʎ=22,ʎ=25 and ʎ=30.	Understand	CO 1	AEE016.03
20	A two plant hydro-thermal system with negligible losses has the following characteristics. Fuel cost as a function of active power generated at the thermal plant is $F = (2p_1=0.01p_2^2)$ RS/hr. The optimal water conversion co-efficient is found to be 12.01RS/MCF. The load on	Understand	CO 1	AEE016.04

<table>
<tr><td></td><td>the system is<table><tr><td>Duration (b)</td><td>9</td><td>15</td></tr><tr><td>DD (MW)</td><td>700</td><td>350</td></tr></table>Compute the optimal active thermal and hydro power generations (in MW) in each of the subintervals and the allowable volume of water at the hydro plant</td><td></td><td></td><td></td></tr>
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UNIT-II

MODELING OF GOVERNOR, TURBINE AND EXCITATION SYSTEMS

Part – A (Short Answer Questions)

1	Distinguish D.C excitation system and A.C excitation system.	Understand	CO 2	AEE016.05
2	Distinguish between AVR and ALFC control loops of a generator.	Understand	CO 2	AEE016.05
3	What is the main classification of an exciter?	Understand	CO 2	AEE016.06
4	How is the excitation system stabilizer realized?	Understand	CO 2	AEE016.05
5	What is an AVR? What are its components?	Remember	CO 2	AEE016.05
6	What is an AC excitation system?	Understand	CO 2	AEE016.06
7	What are merits of an AC excitation System?	Remember	CO 2	AEE016.05
9	Describe the mathematical model of Speed - Governing System.	Understand	CO 2	AEE016.05
10	Estimate the importance of turbine modeling?	Understand	CO 2	AEE016.05
11	Generalize the importance of Generator modeling?	Remember	CO 2	AEE016.05
12	Compute the importance of Exciter modeling?	Remember	CO 2	AEE016.06
13	Explain the importance of dynamic modeling of generators?	Understand	CO 2	AEE016.05
14	Define Swing Equation?	Understand	CO 2	AEE016.05
15	Derive Small signal transfer function?	Understand	CO 2	AEE016.05
16	Write short notes on modeling of speed governing system?	Remember	CO 2	AEE016.05
17	Define speed-governing system	Remember	CO 2	AEE016.05
18	What is the function of speed governor?	Remember	CO 2	AEE016.05
19	Compute the function of speed charger?	Remember	CO 2	AEE016.05
20	Define function of hydraulic amplifier?	Remember	CO 2	AEE016.05
21	What is function of linkage mechanism?	Remember	CO 2	AEE016.05
22	Write short notes on modeling of excitation?	Remember	CO 2	AEE016.06
23	List the two fundamental characteristics of modeling of excitation?	Remember	CO 2	AEE016.06
24	Define transfer function?	Remember	CO 2	AEE016.06
25	Write transfer function of modeling of excitation?	Remember	CO 2	AEE016.06
26	What is the IEEE-I model?	Remember	CO 2	AEE016.05

Part - B (Long Answer Questions)

1	Discuss the mechanical – hydraulic control and electro – hydraulic control speed governing system of steam turbine.	Understand	CO 2	AEE016.05
2	Derive the transfer function of overall excitation system?	Understand	CO 2	AEE016.06
3	Draw the block diagram of a power system showing the governor, turbine and Synchronous generator, indicating their transfer functions. For a step disturbance of PD.	Understand	CO 2	AEE016.05
4	Obtain the response of increment in frequency", make suitable assumptions. (a) Without proportional plus integral controller and (b) With proportional plus integral control	Understand	CO 2	AEE016.05
5	Explain the classifications of excitation systems?	Understand	CO 2	AEE016.06
6	Explain the various components of a block diagram representation of a general excitation system?	Understand	CO 2	AEE016.06
7	Explain the different types of limiters and their role in speed- governing system modeling.	Understand	CO 2	AEE016.05
8	Explain the effect of varying excitation of a synchronous generator?	Understand	CO 2	AEE016.06
10	Derive the mathematical modeling of Speed governing system.	Understand	CO 2	AEE016.05
11	Discuss the first order modeling of turbine with neat block diagram?	Understand	CO 2	AEE016.05
12	Explain the methods of providing excitation systems.	Understand	CO 2	AEE016.06
13	Outline the fundamental characteristics of excitation system?	Understand	CO 2	AEE016.06

Part - C (Problem Solving and Critical Thinking Questions)

1	Determine the primary ALFC loop parameters for a control area with the following data: Total generation capacity = 2500 MW	Understand	CO 2	AEE016.05

	Normal operating load =1500 MW Inertia constant=5 kW-seconds per kVA; Load damping constant, B=1 %; frequency, f=50 Hz; and Speed regulation, R=2.5 Hz / p.u MW.			
2	A 100 MVA Synchronous generator operates at 50 Hz, runs at 3000 rpm under no- load. A load of 25 MW is suddenly applied to the machine. Due to the time lag in the governor system the turbine commences to open after 0.6 sec. Assuming inertia constant H= 5 MW- sec per MVA of generator capacity, calculate the frequency of the system before steam own commences to increase to meet the new load.	Understand	CO 2	AEE016.05
3	Two generating stations 1 and 2 have full load capacities of 200 MW and 100 MW respectively at a generating frequency of 50 Hz. The two stations are interconnected by an induction motor and synchronous generator with a full load capacity of 25 MW. The speed regulation of station 1, station 2 and induction motor and synchronous generator sets are 4 %, 3.5% and 2.5% respectively. The load on respective bus bars is 75 MW and 50 MW respectively. Find the load taken by the motor generator set.	Understand	CO 2	AEE016.05
4	Two turbo alternators rated for 110 MW and 220 MW have governor drop characteristics of 5% from no load to full load. They are connected in parallel to share a load of 250 MW. Determine the load shared by each machine assuming free governor action.	Understand	CO 2	AEE016.05
5	Two generating stations 1 and 2 have full load capacities of 300 MW and 200 MW respectively at a generating frequency of 50 Hz. The two stations are interconnected by an induction motor and synchronous generator with a full load capacity of 50 MW. The speed regulation of station 1, station 2 and induction motor and synchronous generator sets are 45%, 4% and 3% respectively. The load on respective bus bars is 70 MW and 60 MW respectively. Find the load taken by the motor generator set.	Understand	CO 2	AEE016.05
6	Two turbo alternators rated for 150 MW and 250 MW have governor drop characteristics of 8% from no load to full load. They are connected in parallel to share a load of 300 MW. Determine the load shared by each machine assuming free governor action.	Understand	CO 2	AEE016.05
7	Two generators rated 200MW and 400MW are operating in parallel. Draw the characteristics of their governors are 4% and 5% respectively from no load to full load. Assuming that the generators are operating at 50 Hz at no load, how would a load of 600MW is shared between them? What will be the system frequency at this load, Assume free governor operation, repeat the problem if both governors have drop of 4%.	Understand	CO 2	AEE016.05
8	Two generators rated 400MW and 700MW are operating in parallel. Draw the characteristics of their governors are 6% and 8% respectively from no load to full load. Assuming that the generators are operating at 50 Hz at no load, how would a load of 900MW be shared between them? What will be the system frequency at this load, Assume free governor operation, repeat the problem if both governors have drop of 7%.	Understand	CO 2	AEE016.05
9	Determine the primary ALFC loop parameters for a control area with the following data: Total generation capacity = 3500 MW Normal operating load =2500 MW Inertia constant=25 kW-seconds per kVA; Load damping constant, B=2 %; frequency, f=50 Hz; and Speed regulation, R=3.5 Hz / p.u MW	Understand	CO 2	AEE016.05
10	A 400 MVA Synchronous generator operates at 50 Hz, runs at 3000 rpm under no- load. A load of 50 MW is suddenly applied to the machine. Due to the time lag in the governor system the turbine commences to open after 0.6 sec. Assuming inertia constant H= 9 MW- sec per MVA of generator capacity, calculate the frequency of the system before steam own commences to increase to meet the new load.	Understand	CO 2	AEE016.05
11	Two generating stations 1 and 2 have full load capacities of 200 MW and 100 MW respectively at a generating frequency of 50 Hz. The two stations are interconnected by an induction motor and synchronous generator with a full load capacity of 25 MW. The speed regulation of station 1, station 2 and induction motor and synchronous generator sets are 4 %, 3.5% and	Understand	CO 2	AEE016.05

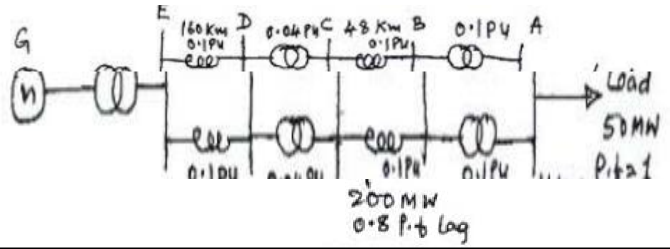
	2.5% respectively. The load on respective bus bars is 75 MW and 50 MW respectively. Find the load taken by the motor generator set.			
12	Two turbo alternators rated for 110 MW and 220 MW have governor drop characteristics of 5% from no load to full load. They are connected in parallel to share a load of 250 MW. Determine the load shared by each machine assuming free governor action.	Understand	CO 2	AEE016.05
13	Two generating stations 1 and 2 have full load capacities of 300 MW and 200 MW respectively at a generating frequency of 50 Hz. The two stations are interconnected by an induction motor and synchronous generator with a full load capacity of 50 MW. The speed regulation of station 1, station 2 and induction motor and synchronous generator sets are 45%, 4% and 3% respectively. The load on respective bus bars is 70 MW and 60 MW respectively. Find the load taken by the motor generator set.	Understand	CO 2	AEE016.05
14	Two turbo alternators rated for 150 MW and 250 MW have governor drop characteristics of 8% from no load to full load. They are connected in parallel to share a load of 300 MW. Determine the load shared by each machine assuming free governor action.	Understand	CO 2	AEE016.05
15	Two generators rated 200MW and 400MW are operating in parallel. Draw the characteristics of their governors are 4% and 5% respectively from no load to full load. Assuming that the generators are operating at 50 Hz at no load, how would a load of 600MW is shared between them? What will be the system frequency at this load, Assume free governor operation, repeat the problem if both governors have drop of 4%.	Understand	CO 2	AEE016.05
UNIT -III				
SINGLE AREA AND TWO AREA LOAD FREQUENCY CONTROL				
Part - A (Short Answer Questions)				
1	Define control area.	Remember	CO 3	AEE016.07
2	Write Short notes on control area concept.	Remember	CO 3	AEE016.07
3	Write Short notes on area control error.	Understand	CO 3	AEE016.07
4	What is tie line bias control?	Remember	CO 3	AEE016.07
5	Define the static response.	Remember	CO 3	AEE016.07
6	What is the function of Load Frequency Control	Understand	CO 3	AEE016.07
7	Identify the purpose power factor primary ALFC?	Understand	CO 3	AEE016.07
8	List out the various needs for frequency regulation in power system.	Remember	CO 3	AEE016.07
9	List out the various methods of voltage control in transmission system?	Understand	CO 3	AEE016.07
10	Define single area system	Understand	CO 3	AEE016.07
11	Write expression for steady state response of a load frequency controller with integral control	Understand	CO 3	AEE016.08
12	What are the merits of proportional plus integral ?	Remember	CO 3	AEE016.08
13	Define control variables?	Remember	CO 3	AEE016.08
14	State the basic role of ALFC?	Understand	CO 3	AEE016.08
15	Define steady state response??	Remember	CO 3	AEE016.08
16	List out the methods to keep the frequency constant.	Remember	CO 3	AEE016.08
17	Compute the necessity of keeping the frequency constant in a power system	Understand	CO 3	AEE016.08
18	Define two Area load frequency control.	Remember	CO 3	AEE016.08
19	Define dynamic response.	Remember	CO 3	AEE016.08
20	Define pool operation?	Understand	CO 3	AEE016.08
Part – B (Long Answer Questions)				
1	Explain the state variable model of single area load frequency controller with integral action.	Understand	CO 3	AEE016.07
2	Discuss the importance of combined load frequency control and economic dispatch control with a neat block diagram	Understand	CO 3	AEE016.07
3	Define control area. Obtain the transfer function model and explain ALFC of a single area of an isolated power system.	Understand	CO 3	AEE016.07
4	Describe the nature of the steady state response of the uncontrolled load frequency control of a single area?	Understand	CO 3	AEE016.07
5	List out the basic requirements of a closed loop control system employed	Understand	CO 3	AEE016.07

<table>
<tr><td></td><td>for obtaining the frequency constant?</td><td></td><td></td><td></td></tr>
<tr><td>6</td><td>With a neat block diagram explain the load frequency control for a single area system.</td><td>Understand</td><td>CO 3</td><td>AEE016.07</td></tr>
<tr><td>7</td><td>Draw and explain complete block diagram representation of single area having a turbo-generator supplying an isolated load for load frequency problem. Discuss the response of the system for a sudden change in load demand</td><td>Understand</td><td>CO 3</td><td>AEE016.07</td></tr>
<tr><td>8</td><td>Explain tie line bias bar control.</td><td>Understand</td><td>CO 3</td><td>AEE016.07</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>11</td><td>List out the requirements of control strategy in integral control? Explain the role played by the controller's gain setting in the frequency control.</td><td>Understand</td><td>CO 3</td><td>AEE016.08</td></tr>
<tr><td>12</td><td>Obtain an expression for steady state response of a load frequency controller with integral control. How it is different from without integral control.</td><td>Understand</td><td>CO 3</td><td>AEE016.07</td></tr>
<tr><td>13</td><td>Discuss the merits of proportional plus integral load frequency control of a system with a neat block diagram.</td><td>Understand</td><td>CO 3</td><td>AEE016.08</td></tr>
<tr><td>14</td><td>State briefly how the time response of the frequency error depends upon the gain setting of the integral control</td><td>Understand</td><td>CO 3</td><td>AEE016.08</td></tr>
<tr><td>15</td><td>Draw the block diagram of load frequency control of two- area control systems with gain blocks</td><td>Understand</td><td>CO 3</td><td>AEE016.07</td></tr>
<tr><td>16</td><td>Give a typical block diagram for a two area system interconnected by a tie line and explain each block. Also deduce relations to determine the frequency of oscillations of tie line power and static frequency drop. List out assumptions made.</td><td>Understand</td><td>CO 3</td><td>AEE016.07</td></tr>
<tr><td>17</td><td>Describe the steady state analysis in controlled case and un-controlled case?</td><td>Understand</td><td>CO 3</td><td>AEE016.08</td></tr>
<tr><td>18</td><td>Two areas of a power system network are interconnected by a tie-line, whose capacity is 250MW, operating at a power angle of 450. If each area has a capacity of 2000 MW and the equal speed regulation of 3 Hz/Pu MW, determine the frequency of oscillation of the power for step change in load. Assume that both areas have the same inertia constants of H = 4 sec. If a step load change of 100MW occurs in one of the areas determine the change in tie-line power.</td><td>Understand</td><td>CO 3</td><td>AEE016.07</td></tr>
<tr><td colspan="5">Part – C (Problem Solving and Critical Thinking)</td></tr>
<tr><td>1</td><td>A 125 MVA turbo alternator operates on full load at 50 Hz. A load of 50MWis suddenly reduced on the machine. The steam valves to the turbine commence to close after 0.5 seconds due to the time lag in the governor system. Assuming inertia constant H= 6 kW - sec per kVA of generator capacity, calculate the change in frequency that occurs in this time.</td><td>Understand</td><td>CO 3</td><td>AEE016.07</td></tr>
<tr><td>2</td><td>The single area control system has the following data: TP=10 sec, Tg = 0.3 sec, Tt=0.2 sec, KP =200 Hz/pu MW, R=6 Hz/pu MW, PD=0.5 pu MW, Ki=0.5. Compute the time error caused by a step disturbance of magnitude 0.5 pu (as given above). Prove, in particular, that the error is reduced by increasing the given Ki. Express the error in seconds and cycles if the system frequency is 50 Hz.</td><td>Understand</td><td>CO 3</td><td>AEE016.07</td></tr>
<tr><td>3</td><td>A single area consists of two generators with the following parameters: Generator 1 = 1200 MVA; R=6 % (on machine base) Generator 2 = 1000 MVA; R=4 % (on machine base) The units are sharing 1800 MW at normal frequency 50 Hz. Unit supplies 1000 MW and unit 2 supplies 800 MW. The load now increased by 200 MW.
(a) Find steady state frequency and generation of each unit if B=0.
(b) Find steady state frequency and generation of each unit if B=1.5.</td><td>Understand</td><td>CO 3</td><td>AEE016.07</td></tr>
<tr><td>4</td><td>A single area consists of two generating units with the following
<table>
<tr><td>unit</td><td>Rating in MVA</td><td>Speed regulation R (p.u on unit MVA base)</td></tr>
<tr><td>1</td><td>600</td><td>6%</td></tr>
<tr><td>2</td><td>500</td><td>4%</td></tr>
</table>
characteristics. The units are operating in parallel, sharing 900 MW at a</td><td>Understand</td><td>CO 3</td><td>AEE016.07</td></tr>
</table>

	nominal frequency. Unit 1 supplies 500 MW and unit 2 supplies 400 MW at 60 Hz. The load is increased by 90 MW. (a) Assume there is no frequency dependent load i,e., B=0. Find the steady state frequency deviation and new generation on each unit. (b) The load varies 1.5 % for every 1 % change in frequency i.e., B= 1.5. Find the steady state frequency deviation and new generation on each unit.			
5	A Generator in single area load frequency control has the following parameters: Total generation capacity = 2500 MW Normal operating load =1500 MW Inertia constant=5 kW-seconds per kVA; Load damping constant, B=1 %; frequency, f=50 Hz; and Speed regulation, R=2.5 Hz / p.u MW. If there is a 1.5 % increase in the load, find the frequency drop (a) without governor control (b) With governor control.	Understand	CO 3	AEE016.07
6	A250MVA synchronous generator is operating at 1500 rpm, 50 Hz. A load of 50 MW is suddenly applied to the machine and the station valve to the turbine opens only after 0.35 sec due to the time lag in the generator action. Calculate the frequency at which the generated voltage drops before the steam flow commences to increase to meet the new load. Given that the valve of H of the generator is 3.5 KW-s per KVA of the generator energy.	Understand	CO 3	AEE016.07
7	Two power systems, A and B, having capacities of 3000 and 2000 MW, respectively, are interconnected through a tie-line and both operate with frequency-bias-tie-line control. The frequency bias for each area is 1 % of the system capacity per 0.1 Hz frequency deviation. If the tie-line interchange for A is set at 100 MW and for B is set (incorrectly) at 200 MW, calculate the steady state change in frequency.	Understand	CO 3	AEE016.07
8	Two control areas have the following characteristics: Area-1: Speed regulation = 0.02 pu ,Damping coefficient = 0.8 pu ,Rated MVA = 1500 Area-2: Speed regulation = 0.025 pu, Damping co-efficient = 0.9 pu, Rated MVA = 500 Determine the steady state frequency change and the changed frequency following a load change of 120MW occurs in area-1. Also find the tie-line power flow change.	Understand	CO 3	AEE016.07
9	The two area system has the following data: Capacity of area 1, Pr1 =1000 MW, Capacity of area 2, Pr2 =2000 MW, Nominal load of area 1, PD1=500 MW Nominal load of area 1, PD1=1500 MW Speed regulation of area 1=4% Speed regulation of area 2=3% Find the new steady state frequency and change in the line ow for a load change of area 2 by 125 MW. For both the areas each percent change in frequency causes 1 percent change in load. Find also the amount of additional frequency drop if the interconnection is lost due to certain reasons.	Understand	CO 3	AEE016.07
10	Explain the state variable model of two area load frequency controller with integral action. Two control areas connected by a tie line have the following characteristics. Area 1 Area 2 R=0.01 pu R=0.02 pu D=0.8 pu D=1.0 pu Base MVA=2000 Base MVA=500 A load change of 100 MW (0.2 pu) occurs in area 1. What is the new steady state frequency and what is the change in the tie own? Assume both areas were at nominal frequency (60 Hz) to begin.	Understand	CO 3	AEE016.07
11	Two generators rated 250 MW and 500 MW are operating in parallel. The droop characteristics are 4% and 6% respectively. Assuming that the generators are operating at 50 HZ at no load, how a load of 750 MW would be shared. What is the system frequency? Assume free governor action	Understand	CO 3	AEE016.07

12	Two control areas have the following characteristics: Area-1: Speed regulation = 0.04 p.u ,Damping coefficient = 0.6 p.u ,Rated MVA = 1300 Area-2: Speed regulation = 0.03 p.u, Damping co-efficient = 0.85 p.u, Rated MVA = 500 Determine the steady state frequency change and the changed frequency following a load change of 150MW occurs in area-1. Also find the tie-line power flow change.	Understand	CO 3	AEE016.07
13	Two areas of a power system network are interconnected by a tie-line, whose capacity is 350MW, operating at a power angle of 450. If each area has a capacity of 3000 MW and the equal speed regulation of 6Hz/P.u MW, determine the frequency of oscillation of the power for step change in load. Assume that both areas have the same inertia constants of H = 5 sec. If a step load change of 120MW occurs in one of the areas determine the change in tie-line power.	Understand	CO 3	AEE016.08
14	Two Generating Stations A and B have full load capacities of 350 and 500MW, respectively. The interconnector connecting the two stations has an induction motor/synchronous generator of full load capacity 40 MW; percentage changes of speeds of A, B and C are 5, 4 and 2 respectively. Determine the load taken by plant C and indicate the direction of the power flow	Understand	CO 3	AEE016.08
UNIT -IV				
COMPENSATION FOR POWER FACTOR IMPROVEMENT AND REACTIVE POWER CONTROL				
Part – A (Short Answer Questions)				
1	List out the disadvantages of low voltage and low power factor of the system.	Remember	CO 4	AEE016.11
2	Write the importance of power factor correction	Remember	CO 4	AEE016.11
3	List the financial benefits due to voltage improvement	Remember	CO 4	AEE016.11
4	Write advantages of series compensation.	Remember	CO 4	AEE016.10
5	List out the advantages of shunt compensation.	Understand	CO 4	AEE016.09
6	Define voltage regulation?	Remember	CO 4	AEE016.09
7	Define voltage drop?	Understand	CO 4	AEE016.09
8	Define nominal voltage?	Understand	CO 4	AEE016.10
9	Define rated voltage?	Understand	CO 4	AEE016.10
10	Define utilization voltage?	Understand	CO 4	AEE016.10
11	What are the advantages and disadvantages of automatic voltage booster?	Remember	CO 4	AEE016.10
12	Write two applications of induction regulators.	Understand	CO 4	AEE016.10
13	Generalize how the generators act as VAR sources in a power network?	Understand	CO 4	AEE016.10
14	Generalize how the voltage control is achieved by injection of power at nodes?	Understand	CO 4	AEE016.10
15	List out different sources of reactive power absorbers in a power system?	Remember	CO 4	AEE016.10
16	Compute the need for voltage and frequency regulation in power system?	Understand	CO 4	AEE016.12
Part – B (Long Answer Questions)				
1	Discuss the effect of shunt compensation on distribution system.	Understand	CO 4	AEE016.09
2	Compare and explain the role of shunt and series capacitors in power factor correction.	Understand	CO 4	AEE016.11
3	What are the differences between fixed and switched capacitors? What are their effects on distribution systems?	Understand	CO 4	AEE016.10
4	Discuss the procedure employed to determine the best capacitor location.	Understand	CO 4	AEE016.10
5	Discuss how a series capacitor boosts the voltage with the help of a phasor diagram? What are the drawbacks of this method?	Understand	CO 4	AEE016.10
6	Discuss different types of capacitors used in distribution network to improve power factor.	Understand	CO 4	AEE016.11
7	Why the improvement of power factor is very important for both consumers and generating stations? List the various causes of low power factor and explain	Understand	CO 4	AEE016.11
8	How economic power factor arrived at for a given distribution system with different loads?	Understand	CO 4	AEE016.11
9	Voltage control and p.f correction are necessary in power systems. Explain.	Understand	CO 4	AEE016.11

	What are the disadvantages of low voltage and low p.f of the system?			
10	Discuss how an overexcited synchronous machine improves power factor.	Understand	CO 4	AEE016.11
11	How an AVR can control voltage? With the aid of suitable diagram, explain its function?	Understand	CO 4	AEE016.11
12	Briefly explain the line drop compensation on voltage control?	Understand	CO 4	AEE016.11
13	How do the shunt capacitors and reactors control the voltage? List the disadvantages of using a shunt capacitor for voltage control?	Understand	CO 4	AEE016.11
14	Discuss about the losses occurred due to VAR flow in power system?	Understand	CO 4	AEE016.12
15	Describe the generators are acted as VAR sources in a power network?	Understand	CO 4	AEE016.12
16	Explain compensated and uncompensated transmission lines.	Understand	CO 4	AEE016.12
17	Explain clearly what you mean by compensation of line and discuss briefly different methods of compensation.	Understand	CO 4	AEE016.12
Part – C (Problem Solving and Critical Thinking)				
1	A 3-phase substation transformer has a name plate rating of 7500 kVA and a thermal capability of 125% of the name plate rating. If the connected load is 8816 kVA with a 0.9power factor (lagging), determine the following: i. the kVAR rating of the shunt capacitor bank required to decrease the kVA load of the transformer to its capability level ii. The power factor of the corrected level.	Understand	CO 4	AEE016.11
2	A 3phase transformer rated 7000kVA and has a over load capability of 125 % of the rating. Ifthe connected load is 1150 kVA with a 0.8 p.f(lag), determine the following: i. The kVAR rating of shunt capacitor bank required to decrease the kVA load of the transformer to its capability level, ii. The kVAR raring of the shunt capacitor bank required to correct the load p.f. to unity. iii. The p.f. of the corrected level.	Understand	CO 4	AEE016.10
3	A 440 V, 50 cycles three phase line delivers 250 KW at 0.7 p.f (lag). It is desire to bring the line p.f to unity by installing shunt capacitors. Calculate the capacitance if they are: i. star connected ii. delta connected	Understand	CO 4	AEE016.09
4	A 3 phase substation transformer has a name plate rating of 7250 KVA and a thermal capability of 120% of the name plate rating. If the connected load is is 8816 KVA with a 0.85 of lag p.f determine the following a. The KVAR rating of the shunt capacitor tank required to decrease the KVA load of the transformer to its capability level b. The power factor of the corrected level.	Understand	CO 4	AEE016.11
5	A single-phase motor takes a current of 10 amps at a p.f. of 0.707 lagging from a 230V, 50 Hz supply. What value must a shunting capacitor have to raise the p.f. to unity	Understand	CO 4	AEE016.10
6	Discuss the computerized method to determine the economic power factor.	Understand	CO 4	AEE016.11
7	A 750 KVA load has a power factor of0.75 lag. It is derived to improve the power factor to 0.9 lag . Find the KVAR rating of the capacitor for the power factor improvement.	Understand	CO 4	AEE016.11
8	A synchronous motor having a power consumption of 40 KW is connected with a load of 150KW, a lag power factor of 0.8. if the combined load has a power factor of 0.9, what is the leading reactive KVA supplied by the motor and at what p.f is it working.	Understand	CO 4	AEE016.11
9	A 3 phase substation transformer has a name plate rating of 7000 KVA and a thermal capability of 125% of the name plate rating. If the connected load is is 1150 KVA with a 0.8 of lag p.f determine the following a) The KVAR rating of the shunt capacitor tank required to decrease the KVA load of the transformer to its capability level b) The power factor of the corrected level.	Understand	CO 4	AEE016.10
10	A 400 V 50 cycles three phase line delivers 207KW at 0.8 p.f lag. It is desired to bring the line p.f to unity by installing shunt capacitors, calculate the capacitance if they are i. star connected ii.delta connected.	Understand	CO 4	AEE016.11
11	Briefly explain the different methods of reactive power injection in the power system. 10 In a radial transmission system shown in figure, all p.u values are referred to the voltage bases shown and 100 MVA. Determine the power factor at which the generator must operate.	Understand	CO 4	AEE016.10

				
12	Find the rating of synchronous compensator connected to the tertiary winding of a 132 kV star connected, 33 kV star connected, 11 kV delta connected three winding transformer to supply a load of 66 MW at 0.8 p.f. lagging at 33 kV across the secondary. The equivalent primary and secondary winding reactances are 32 ohms and 0.16 ohms respectively while the secondary winding reactance is negligible. Assume that the primary side voltage is essentially constant at 132 kV and maximum of nominal setting between transformer primary and secondary is1.1.	Understand	CO 4	AEE016.11
13	A 3-phase single circuit, 220kV, line runs at no load. Voltage at the receiving end of the line is 205kV. Find the sending end voltage, if the line has resistance of 21.7ohms, reactance of 85.2ohms and the total susceptance of 5.32X10^{-4} mho. The transmission line is to be represented by Pie-model.	Understand	CO 4	AEE016.12
14	Design a static VAR compensator for a low voltage distribution system with the following specifications: System voltage = 440 V System frequency = 50 Hz Coil inductance, L=5.37 mH The inductor saturates at 950 A and settles to a value of 1.8 mH at 1800 A. Compensation is required over a range of -80 kVAR to +30 kVAR per phase.	Understand	CO 4	AEE016.12
15	The load at receiving end of a three-phase, over head line is 25.5 MW, power factor 0.8 lagging, at a line voltage of 33 kV. A synchronous compensator is situated at receiving end and the voltage at both the ends of the line is maintained at 33 kV. Calculate the MVAR of the compensator. The line has a resistance of 4.5 ohms per phase and inductive reactance (line to neutral) of 20 ohms per phase.	Understand	CO 4	AEE016.12
UNIT -V				
LOAD COMPENSATION				
Part - A (Short Answer Questions)				
1	Write short notes on load management functions	Understand	CO 5	AEE016.13
2	Define demand?	Remember	CO 5	AEE016.13
3	Define coincidence Factor?	Understand	CO 5	AEE016.13
4	Define contribution factor.	Remember	CO 5	AEE016.13
5	Define loss factor?	Remember	CO 5	AEE016.14
6	Define load factor?	Remember	CO 5	AEE016.13
7	Define load diversity factor?	Understand	CO 5	AEE016.13
8	What is Maximum demand?	Understand	CO 5	AEE016.13
9	Define coincident demand?	Understand	CO 5	AEE016.14
10	Define Non-coincident demand?	Understand	CO 5	AEE016.14
11	What is meant by term load? How loads can be classified?	Remember	CO 5	AEE016.14
12	Define distribution system?	Understand	CO 5	AEE016.13
13	Define demand factor?	Remember	CO 5	AEE016.13
14	Define load?	Understand	CO 5	AEE016.13
15	List out types of loads and give examples?	Remember	CO 5	AEE016.13
Part - B (Long Answer Questions)				
1	List out the various factors affecting the distribution system planning?	Understand	CO 5	AEE016.13
2	Draw a block diagram in flow chart form for a typical distribution system planning process and explain the techniques for distribution planning.	Understand	CO 5	AEE016.13
3	Explain briefly the classification of loads and modeling of load in	Understand	CO 5	AEE016.13

<table>
<tr><td></td><td>distribution networks?</td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>Obtain the relation between the load factor and loss factor.</td><td>Understand</td><td>CO 5</td><td>AEE016.14</td></tr>
<tr><td>5</td><td>Discuss in detail about agriculture and industrial loads and their respective characteristics.</td><td>Understand</td><td>CO 5</td><td>AEE016.13</td></tr>
<tr><td>6</td><td>Differentiate between DC and AC systems?</td><td>Understand</td><td>CO 5</td><td>AEE016.13</td></tr>
<tr><td>7</td><td>Explain residential and commercial loads and their characteristics?</td><td>Understand</td><td>CO 5</td><td>AEE016.13</td></tr>
<tr><td colspan="5">**Part – C (Problem Solving and Critical Thinking)**</td></tr>
<tr><td>1</td><td>At the end of a power distribution system, a certain feeder supplies three distribution transformer, each one supplying a group of customers whose connected loads are as under, if the diversity factor among the transformers is 1.3, find the maximum load on the feeder.
<table>
<tr><td>Transformer</td><td>Load</td><td>Demand Factor</td><td>Diversity Factor</td></tr>
<tr><td>No.1</td><td>10kw</td><td>0.65</td><td>1.5</td></tr>
<tr><td>No 2</td><td>12kw</td><td>0.</td><td>3.5</td></tr>
<tr><td>No.3</td><td>15kw</td><td>0.7</td><td>1.5</td></tr>
</table></td><td>Understand</td><td>CO 5</td><td>AEE016.13</td></tr>
<tr><td>2</td><td>Distribution substation experiences an annual peak load of 3, 500 KW. The total annual energy supplied to the primary feeder circuits is 10^7 kwh. Find i)The annual average Factor ii) The annual Load Factor</td><td>Understand</td><td>CO 5</td><td>AEE016.14</td></tr>
<tr><td>3</td><td>Annual peak load input to a primary feeder is 2000kw at which the power loss is total copper loss at the time of peak load is $\sum I^2R$=100kw. The total annual energy supplied to the sending end of the feeder is $5.61*10^6$ kwh. Determine.
i) Annual loss factor
ii) Total annual copper loss energy and its value Rs.1.50 per kwh</td><td>Understand</td><td>CO 5</td><td>AEE016.14</td></tr>
<tr><td>4</td><td>Assume that load of 100kw is connected at the riverside substation, the 15 min. weekly maximum demand is given as 75 kw, and the weekly energy consumption is 4200 kwh. Assuming a week is 7 days; find the demand factor and the 15 min. weekly load factor of the substation.</td><td>Understand</td><td>CO 5</td><td>AEE016.14</td></tr>
<tr><td>5</td><td>Discuss how the maximum demand and average demand can be obtained from daily demand variation curve.</td><td>Understand</td><td>CO 5</td><td>AEE016.14</td></tr>
<tr><td>6</td><td>A 50 MW hydro generator delivers 320 million kwh during the year. Calculate the plant load factor.</td><td>Understand</td><td>CO 5</td><td>AEE016.14</td></tr>
<tr><td>7</td><td>Annual peak load input to a primary feeder is 2000kw at which the power loss is total copper loss at the time of peak load is $\sum I^2R$=100kw. The total annual energy supplied to the sending end of the feeder is $5.61*10^6$ kwh. Determine. I) Annual loss factor
ii) Total annual copper loss energy and its value Rs0.03 per kwh</td><td>Understand</td><td>CO 5</td><td>AEE016.14</td></tr>
<tr><td>8</td><td>Assume that the annual peak load of a primary feeder is 2000 kw , at which the power is 80 kw per three phase. Assuming an annual loss factor of 0.15, determine
i) The average annual power loss.
ii) The total annual energy loss due to the copper loss of the feeder.</td><td>Understand</td><td>CO 5</td><td>AEE016.14</td></tr>
<tr><td>9</td><td>A small city experiences an annual peak load of 3500 kw. The total annual energy supplied to the primary feeder's circuits is $10* 10^6$ kwh. The peak demand occurs in July/August and Is due to air Conditioning load.
i) Find the annual average power demand
ii) Find the annual load factor
iii) Find the annual loss factor</td><td>Understand</td><td>CO 5</td><td>AEE016.14</td></tr>
<tr><td>10</td><td>The annual average load is 1241 kw and monthly peak load is 3600 kw. Find the load factor by using approximate formula.</td><td>Understand</td><td>CO 5</td><td>AEE016.13</td></tr>
</table>

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