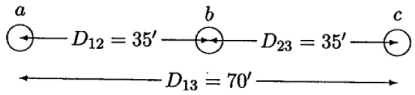
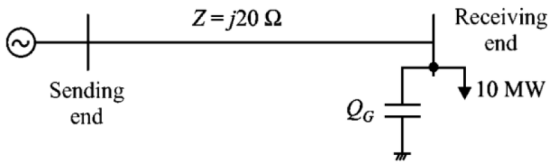
Ref. No: Ex/PE/PC/B/T/311/2024(S)

B. E. Power Engineering 3rd Year 1st Semester Supplementary Examination - 2024

Subject: Power Transfer System **Time: 3 hours** **Full Marks: 100**

No. of Questions		Marks
	CO1 (Answer any *One -30 Marks*)	
1.	a) Show that transmission line voltage will affect the power loss in the line, weight of conductors and transmission efficiency.	10
	b) What is the percentage saving in copper feeder if the line voltage in a 2-wire d.c system is raised from 200 V to 400 V for the same power transmitted over the same distance and having the same power loss?	10
	c) i) What is Load Curve? Put down the information obtained from Load Curve. ii) State the various causes of low power factor in power system.	2+3+5
2.	a) Define and explain briefly the followings: i) Galloping of conductors ii) Coincident Demand or Diversified Demand	5+5
	b) Derive the expression for capacitance of a single core cable.	10
	c) What are the different types of Insulators used in overheard lines? State advantages and disadvantages of each of these.	10
	CO2 (Answer any *One -30 Marks*)	
3.	a) Derive the expression of Inductance of single-phase lines.	10
	b) A 500-kV three-phase transposed line is composed of one *ACSR* 1, 272,000-cmil, 45/7 Bittern conductor per phase with horizontal conductor configuration as shown below. The conductors have a diameter of 1.345in and a *GMR* of 0.5328in. Find the inductance and capacitance per phase per kilometer of the line. 	10
	c) What is subsynchronous resonance (SSR)? Why does this SSR occur in the line? What is Ferranti Effect?	2+3+5
4.	a) Define and explain briefly "Surge Impedance Loading (SIL)? State the limitations of modified Kelvin's law.	5+5
	b) The ABCD constants of a three phase, 345kV transmission line are: *A=D= 0.98182+j0.0012447; B=4.035+j58.947; C= j0.00061137*. The line delivers 400MVA at 0.8 lagging p.f at 345kV. Determine the sending end quantities, voltage regulation and transmission efficiency.	10
	c) Figure below shows a three-phase, 33-kV line feeding a per-phase load of 10 MW. If the impedance of the line is Z =j20 ohm, determine the load angle and the reactive power to be supplied by the capacitive source connected at the load end to maintain a line voltage of 33 kV at the load. 	10
	CO3 (Answer any *One -20 Marks*)	
5.	a) What is FACTS? Explain briefly the operation of TCSC for controlling reactive power flows.	10
	b) Explain the static and dynamic response of an AVR loop.	10

[Turn over

6.	a) Develop transfer functions for a speed governing system. b) Two equal control areas have the following parameters: R = 3.5 Hz/pu MW, H = 4.5s, normal operating frequency $f_{0,}$ = 50 Hz. If the synchronizing coefficient T_0 is equal to 0.2, determine the damping coefficient α and angular frequency ω**.**	10 10
	CO4 (Answer any One -*20 Marks*)	
7.	a) How is the equal area criterion applied when there is a sudden (a) increase in power input, and (b) decrease in power output due to a three-phase fault? b) A generator operating at 60 Hz delivers 1pu MW power. Suddenly a three phase fault takes place reducing the maximum power transferable to 0.40pu MW whereas before the fault, this power was 1.80pu MW and after the clearance of the fault, it is 1.30pu MW. Determine the critical clearing angle.	10 10
8.	a) What is dynamic braking and explain how it helps in improving the transient stability. b) A two-pole, 50-MVA, 11-kVgenerator is supplying full load at 0.8 power factor lagging. If the inertia constant of the moving parts of the generator is 6.0 MJ/MVA, calculate the energy stored when the generator is running at the synchronous speed of 3000 rpm. If the net input to the generator is suddenly increased to 62000 metric HP, calculate the acceleration produced.	10 10