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B.M.S. College of Engineering, Bengaluru-560019

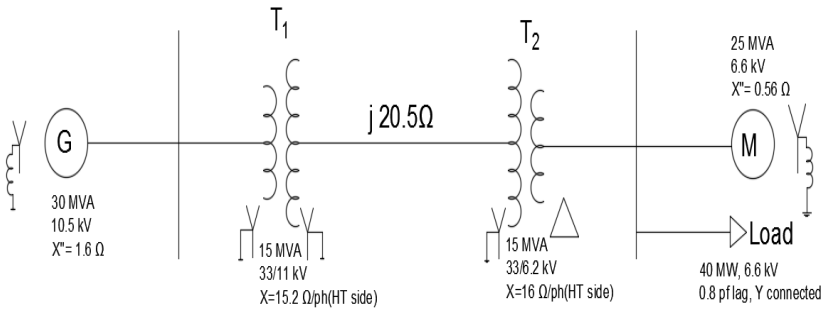
Autonomous Institute Affiliated to VTU

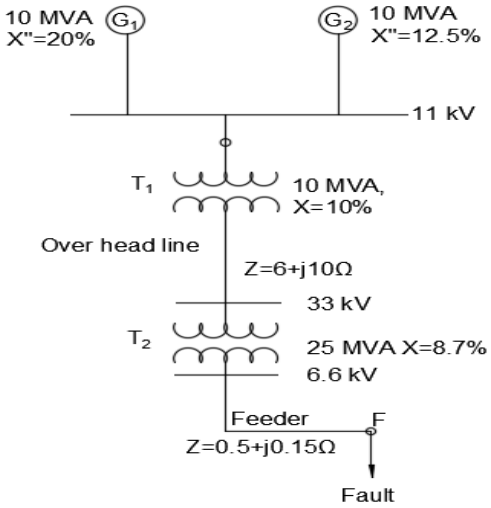
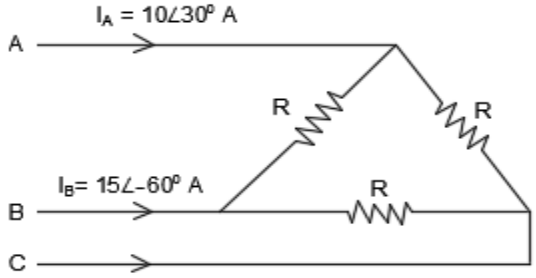
May 2024 Semester End Make-Up Examinations

Programme: B.E. **Semester: V**
Branch: Electrical and Electronics Engineering **Duration: 3 hrs.**
Course Code: 22EE5PCPSA **Max Marks: 100**
Course: Power System Analysis

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	CO	PO	Marks
1	a)		Define the per unit quantity. List any four advantages of per unit computations.	CO1	PO1	**06**
	b)		Prove that the per unit impedance of two winding transformer will remain same whether referred on to primary or secondary side.	CO1	PO1	**06**
	c)		The power system network is shown in Figure 1.  Figure 1 i. Evaluate the per unit impedance of each component for a base of 30 MVA and 33 kV for the transmission line. ii. Draw the per unit impedance diagram of the power system network.	CO1	PO2	**08**
			UNIT - II			
2	a)		Explain the transients occurring on a transmission line on the occurrence of a short circuit. Obtain the expression for maximum momentary current.	CO2	PO1	**10**
	b)		Two generators are connected in parallel to the low- voltage (LV) side of a three-phase Δ-Y transformer. The ratings of the machines are: Generator: G_1 : 50MVA, 13.8KV Sub transient reactance: X" Generator: G_2 : 25MVA, 13.8 KV Sub transient reactance: X' Transformer **:** 75MVA 13.8Δ-6.9 YKV Reactance=10%	CO2	PO2	**10**

			Before the fault occurs, the voltage on the high- voltage (HV) side of the transformer is 66KV. The transformer is unloaded, and there is no circulating current between the generators. Evaluate the sub-transient current in each generators when a three-phase fault occurs on the high voltage side of the transformer.			
			OR			
	3	a)	Discuss the various reactance in an unloaded synchronous generator under short circuit condition with its equivalent circuit diagram.	*CO2*	*PO1*	**10**
		b)	A 3-phase fault occurs at point F, for the radial network shown in Figure 3.  Figure 3. Determine the following: i. Per unit reactance of each component ii. Thevenin's equivalent impedance iii. Fault current	*CO2*	*PO2*	**10**
			UNIT - III			
	4	a)	Develop an expression for three phase complex power in terms of symmetrical components.	*CO2*	*PO1*	**06**
		b)	A balanced resistive load connected across an unbalanced 3-phase supply is shown in Figure 4. Evaluate the symmetrical components of the line currents.  Figure 4.	*CO2*	*PO2*	**06**
		c)	Explain the positive, negative and zero sequence impedances and networks of an unloaded synchronous generator.	*CO2*	*PO1*	**08**

			UNIT – IV			
	5	a)	Discuss on two conductor open faults in power systems.	*CO2*	*PO1*	**06**
		b)	A 50 MVA, 11 kV, 3 –phase synchronous generator is subjected to different types of faults. the fault currents are as follows: • Three phase fault = 2000 A • Line-to-line fault = 1800 A • Line-to-ground fault = 2200 A The generator neutral is solidly grounded. Determine the sequence impedances of the generator.	*CO2*	*PO2*	**06**
		c)	Develop an expression for fault current, when double line-to-ground fault through impedance occurs on an unloaded generator.	*CO2*	*PO1*	**08**
			UNIT - V			
	6	a)	Compare steady state and transient state stability applied to power system stability studies.	*CO3*	*PO1*	**06**
		b)	A 60 Hz, 4 pole turbo-generator rated 100MVA, 13.8 KV has inertia constant of 10 MJ/MVA. The input to the generator is suddenly raised to 60 MW for an electrical load of 50 MW and the rotor acceleration is maintained for 12 cycles. Determine the following: i. Stored energy in the rotor at synchronous speed ii. Rotor acceleration iii. The change in torque angle and rotor speed in rpm at the end of 12 cycles	*CO3*	*PO2*	**06**
		c)	Develop an expression for power angle equation of a non-salient pole synchronous machine connected to an infinite bus. Draw the power angle curve.	*CO3*	*PO1*	**08**
			OR			
	7	a)	Explain any three methods of improving transient stability.	*CO3*	*PO1*	**06**
		b)	Explain the concept of Equal Area Criterion (EAC), when a power system is subjected to sudden change in power input to the generator.	*CO3*	*PO1*	**06**
		c)	Derive swing equation for a synchronous machine connected to an infinite bus.	*CO3*	*PO1*	**08**

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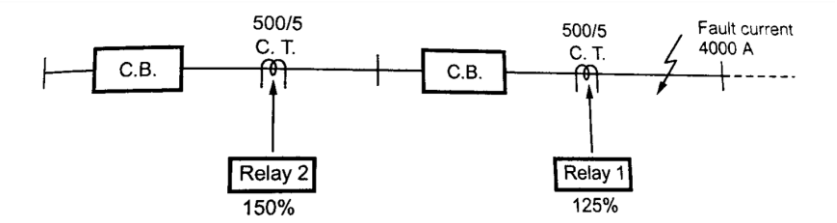
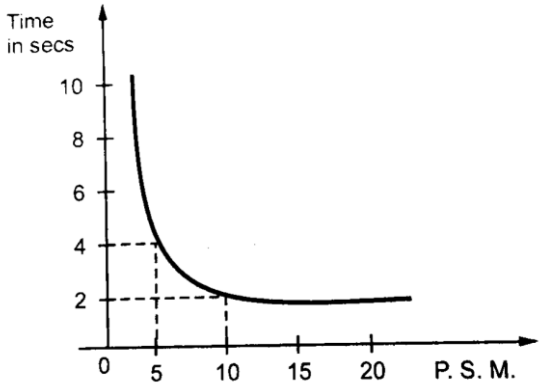
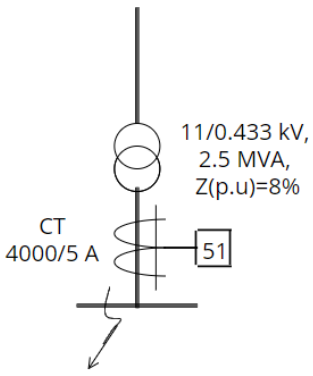
May 2024 Semester End Make-Up Examinations

Programme: B.E. **Semester: V**
Branch: Electrical & Electronics Engineering **Duration: 3 hrs.**
Course Code: 22EE5PCPSP **Max Marks: 100**
Course: POWER SYSTEM PROTECTION

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	*CO*	*PO*	Marks
1	a)	Discuss the essential qualities of protective relaying.	*CO1*	*PO1*	**06**
	b)	Define fuse law. Explain the characteristics of fuses in detail.	*CO1*	*PO1*	**06**
	c)	A 50 Hz generator has e.m.f. to neutral 7.5 kV (r.m.s.). the reactance of generator and connected system is 4 Ω and distributed capacitance to neutral is 0.01 μF with negligible resistance, find: a. Maximum voltage at the circuit breaker contacts. b. Frequency of oscillations. c. RRRV average up to first peak of oscillations.	*CO1*	*PO2*	**08**
		OR			
2	a)	Explain arc interruption theories.	*CO1*	*PO1*	**06**
	b)	Explain primary and back up protection with a neat sketch.	*CO1*	*PO2*	**06**
	c)	For a 132 kV system, the reactance and capacitance up to the location of the circuit breaker is 3 Ω and 0.015 μF respectively. Calculate the following: a. Frequency of transient oscillations. b. Maximum value of Restriking Voltage across the contacts of the circuit breaker. c. Maximum value of RRRV.	*CO1*	*PO2*	**08**
		UNIT – II			
3	a)	Explain the construction and working of Vacuum Circuit breaker with neat diagram. Also mention the advantages and disadvantages of the same.	*CO2*	*PO2*	**08**
	b)	Derive a torque expression for electro-mechanical relay.	*CO2*	*PO2*	**07**

		c)	Fig. 3(c) shows the part of a typical power system. If for the discrimination, the time grading margin between the relays is 0.6 sec; calculate the time of operation of relay 1 and time setting multiplier for relay 2. Refer the characteristics given. Time setting multiplier of relay 1 is 0.3.  Fig. 3(c)  	*CO2*	*PO2*	**05**
			OR			
4		a)	Explain the construction and working of minimum Oil Circuit breaker with neat diagram.	*CO2*	*PO1*	**08**
		b)	Explain the construction and working of directional electro-mechanical relay with neat sketch and characteristics.	*CO2*	*PO1*	**07**
		c)	Find PSM for an IDMT over current relay (51) which is mentioned in the single line diagram.  	*CO2*	*PO2*	**05**
			UNIT – III			
5		a)	With a neat sketch explain the working principle of static relays. What are its advantages and disadvantages?	*CO3*	*PO2*	**07**

		b)	With a neat circuit diagram, explain the working of circulating current type rectifying bridge comparator.	*CO3*	*PO2*	**07**
		c)	With the help of a block diagram, explain the working of block spike co-incidence type of phase comparator.	*CO3*	*PO2*	**06**
			UNIT - IV			
	6	a)	What are the factors that cause faults in generator? Explain the scheme employed for the protection against the earth faults in generator.	*CO3*	*PO2*	**07**
		b)	With a neat diagram, explain the working of Buchholz's relay.	*CO3*	*PO2*	**07**
		c)	Illustrate with a neat diagram Merz-Price voltage balance relay for a feeder protection.	*CO3*	*PO2*	**06**
			UNIT - V			
	7	a)	With a neat block diagram of digital relaying, explain the working and merits of digital relaying.	*CO4*	*PO2*	**08**
		b)	Explain how over current relay coordination is accomplished in interconnected power system.	*CO4*	*PO2*	**06**
		c)	Explain tripping mechanism of digital relay.	*CO4*	*PO2*	**06**

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May 2024 Semester End Make-Up Examinations

Programme: B.E. **Semester: V**
Branch: Electrical and Electronics Engineering **Duration: 3 hrs.**
Course Code: 22EE5PE1SE **Max Marks: 100**
Course: Sustainable Energy Systems

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	CO	PO	Marks
1	a)		Describe with a neat sketch, the principle of Fluidization bed combustion.	CO1	PO2	**08**
	b)		Explain about Energy Scenario in India	CO1	PO1	**05**
	c)		Describe briefly the conventional & Non-conventional Energy Sources	CO1	PO1	**07**
			UNIT - II			
2	a)		With neat schematic diagram, explain the working principle of Nuclear power plant	CO2	PO7	**07**
	b)		What are the site selection considerations for Hydro electric power plant	CO2	PO7	**07**
	c)		Explain the main factors for selection of site for thermal power station.	CO2	PO7	**06**
			OR			
3	a)		With schematic diagram, explain the main parts & operation of a thermal power plant	CO2	PO7	**10**
	b)		Explain the following terms related to hydroelectric power generation: i) Spillway, ii)Surge Tank, iii)Penstock & Tunnel	CO2	PO7	**06**
	c)		Discuss some of the safety measures incorporated in nuclear power plant?	CO2	PO7	**04**
			UNIT - III			
4	a)		With a neat diagram, explain the working of a solar power plant.	CO4	PO6	**08**
	b)		Draw and explain the I-V & P-V characteristics of a solar cell.	CO4	PO6	**05**
	c)		Explain in detail the classifications of solar cells.	CO4	PO6	**07**
			OR			
5	a)		Differentiate stand-alone & Grid connected PV systems	CO4	PO6	**08**

		b)	Explain in detail the solar cell connecting arrangements & also list the applications of solar Photovoltaic Systems	CO4	PO6	**07**
		c)	Explain the concept of partial shading when four modules are shaded.	CO4	PO6	**05**
			UNIT - IV			
	6	a)	Define Smart Grid & mention any Four objectives of Smart Grid?	CO3	PO7	**05**
		b)	What are Hybrid Systems, explain briefly?	CO3	PO7	**05**
		c)	Explain the basic working principle of wind energy conversion system (WECS) with a neat diagram.	CO3	PO7	**10**
			UNIT – V			
	7	a)	Explain the following terms: (i) Connected load (ii) Max. demand (iii) Demand factor, (iv) Average load, (v) Load factor, (vi) Plant use factor, (vii) Plant capacity factor	CO3	PO6	**10**
		b)	Name different types of tariff & explain any three types.	CO3	PO6	**10**

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