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

Autonomous Institute Affiliated to VTU

January 2024 Semester End Main Examinations

Programme: B.E.

Branch: Electrical and Electronics Engineering

Course Code: 19EE7PCSPE

Course: Sustainable Practices in Power Engineering

Semester: VII

Duration: 3 hrs.

Max Marks: 100

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

			UNIT - I			
			CO	PO	Marks	
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.	1	a)	Name top three criteria to sustain the supply of electrical power. List two adverse situations that can result due to loss of electrical power. Name four sources for generation of electrical power, and their pros and cons.	CO2	PO2	3+1+4
		b)	State three key reasons for Technical Losses in Transmission & Distribution of electrical power, and available solution to minimize them. Give one innovative solution to reduce such Technical losses	CO2	PO2	5+1
		c)	State three key reasons for Commercial Losses in Transmission & Distribution of electrical power, and available solution to minimize them. Give one innovative solution to reduce such Commercial losses	CO2	PO2	5+1
			UNIT - II			
	2	a)	Draw a sketch showing construction of an HRC/HBC Fuse-link. Label each component, describe its function , and state its material .	CO3	PO8	2+4
		b)	In what time should a short-circuit current be terminated? In what time should an overload current be terminated?	CO2	PO2	2+2
		c)	List any four LV Switchgear Devices used for protection or control of electrical power, and the range of their Rated Current . Mention their operational life (number of operations) at rated current. Mention their capability to Make, Break, and Withstand Overload current . Mention their capability to Make, Break, and withstand Short-Circuit current .	CO1	PO5	4+2+2 +2
			OR			

	3	a)	<p>Describe contact-bounce in a contactor and when does it happen? Why is it detrimental? How can it be minimized?</p> <p>Describe contact pop-up in a contactor. Is it related to value of current?</p> <p>What are its adverse effects? How can we reduce pop-up?</p>	CO1 CO2	PO5 PO2	2+2+3 +2
		b)	<p>Describe normal operation (AC-3 duty) of a contactor during starting a motor.</p> <p>Describe its operation (AC-4) in locked-rotor situation.</p> <p>Why is the AC-4 duty life of a contactor much lower, than its life for AC-3 duty?</p>	CO1 CO2	PO5 PO2	2+2+2
		c)	<p>Name an application for which we can use a contactor?</p> <p>How is high operational life in millions of operations achieved in contactors?</p> <p>Why the contactor not capable of breaking high short-circuit current?</p>	CO1 CO2	PO5 PO2	1+2+2
			UNIT - III			
4	a)		<p>Draw a schematic diagram to explain the working of an ELCB, the function of CBCT (Core Balance Current Transformer) and (PMR) Relay in it.</p> <p>Describe the Design Parameters associated with (CBCT).</p> <p>How to ensure properties of CBCT are retained through the life of an ELCB?</p>	CO1 CO3	PO5 PO8	4+2+2
	b)		<p>Describe Design Parameters associated components of (PMR) Relay in ELCB?</p> <p>How is flatness, polish and cleanliness of relay's mating surfaces achieved?</p>	CO1 CO2	PO5 PO2	3+3
	c)		<p>Describe the effect of 5mA, 30mA, 100mA current through human body.</p> <p>Within what time should such 100mA current needs to be terminated?</p> <p>How can we quickly terminate leakage currents?</p>	CO1 CO2	PO5 PO2	3+1+2
			OR			
5	a)		<p>Differentiate between Parallel-Arc and Series-Arc.</p> <p>What are potential devices that which has inherent arcing that can give a pseudo signal to cause unwarranted tripping of AFCI / AFDD?</p> <p>In which installations would you recommend not to use devices like AFCI / AFDD?</p>	CO1 CO2	PO5 PO2	2+2+1
	b)		<p>What is Arc-Flash in a Power Panel?</p> <p>Describe the damage that it can cause if it is not controlled?</p> <p>How can the damage due to Arc-Flash be minimised?</p> <p>What parameter (unit) decides the type of PPE to be used?</p>	CO1 CO2 CO3	PO5 PO2 PO8	1+3+3 +1
	c)		<p>Can electrical fires start even at rated current? How?</p> <p>Why do protection devices like Breakers / Fuses not prevent such fires?</p> <p>How do AFCI / AFDD sense and offer protection against small arcing currents? Within what time should undesired arcing current be sensed and interrupted to avoid electrical fire?</p>	CO3 CO2	PO8 PO2	2+2+2 +1

UNIT - IV					
6	a)	Differentiate between Clearance and Creepage associated with electrical switchgear using a sketch. State three reasons that lead to failure of insulating material, and how to mitigate such failures.	<i>CO3</i>	<i>PO3</i>	3+3
	b)	Explain characteristics of following sub-systems in a switchgear: (i) Current Path; (ii) Arc-extinction System; (iii) Auxiliary Signal system? How can each of these sub-systems fail?	<i>CO1 CO2</i>	<i>PO5 PO2</i>	3+3
	c)	Describe Selectivity between upstream & downstream switchgear to improve sustained availability of electricity by drawing a Sketch . Explain how Selectivity is achieved by using Time-Current Characteristics, I^2t Characteristics, Time-Delay, and ZSI (Zone Selective Interlocking)	<i>CO1 CO2</i>	<i>PO5 PO2</i>	4+4
UNIT - V					
7	a)	Describe classification for 'Ingress Protection (IPXX)' for enclosures, used to house electrical switchgear and its related parameters . Explain failure modes if the enclosure fails to meet ingress of solids and liquids.	<i>CO3 CO4</i>	<i>PO8 PO10</i>	4+2
	b)	How does it help to test a product 'to death', as against testing it only for relevant specifications? Give an example of (ALT) Accelerated Life Testing and its benefits.	<i>CO1 CO3</i>	<i>PO5 PO3</i>	2+2
	c)	Why do we need a robust design? Describe three processes that can help to design robust products. For which products is ' Fail-Safe ' design a must? How ' Six Sigma ' approach helps to ensure better quality of products? How would you define and quantify Reliability of products?	<i>CO1 CO4</i>	<i>PO5 PO10</i>	2+3+1 +2+2
