

U.S.N.

# 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.

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.			<b>UNIT - I</b>	<b>CO</b>	<b>PO</b>	<b>Marks</b>
	1	a)	Name <b>top three</b> criteria to sustain the supply of electrical power. List <b>two</b> 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 <b>three</b> key reasons for <b>Technical Losses</b> in Transmission & Distribution of electrical power, and available solution to minimize them. Give one <b>innovative solution</b> to reduce such Technical losses	CO2	PO2	5+1
		c)	State <b>three</b> key reasons for <b>Commercial Losses</b> in Transmission & Distribution of electrical power, and available solution to minimize them. Give one <b>innovative solution</b> to reduce such Commercial losses	CO2	PO2	5+1
			<b>UNIT - II</b>			
	2	a)	Draw a <b>sketch</b> showing construction of an HRC/HBC Fuse-link. <b>Label</b> each component, describe its <b>function</b> , and state its <b>material</b> .	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 <b>four</b> LV Switchgear Devices used for protection or control of electrical power, and the range of their <b>Rated Current</b> . Mention their <b>operational life</b> (number of operations) at rated current. Mention their capability to Make, Break, and Withstand <b>Overload current</b> . Mention their capability to Make, Break, and withstand <b>Short-Circuit current</b> .	CO1	PO5	4+2+2 +2
			<b>OR</b>			

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

			<b>UNIT - IV</b>			
6	a)	Differentiate between <b>Clearance and Creepage</b> associated with electrical switchgear using a sketch. State <b>three</b> reasons that lead to failure of insulating material, and how to mitigate such failures.	CO3	PO3	<b>3+3</b>	
	b)	Explain <b>characteristics</b> 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?	CO1 CO2	PO5 PO2	<b>3+3</b>	
	c)	Describe <b>Selectivity</b> between upstream & downstream switchgear to improve sustained availability of electricity by drawing a <b>Sketch</b> . Explain how Selectivity is <b>achieved</b> by using Time-Current Characteristics, I <sup>2</sup> t Characteristics, Time-Delay, and ZSI (Zone Selective Interlocking)	CO1 CO2	PO5 PO2	<b>4+4</b>	
			<b>UNIT - V</b>			
7	a)	Describe <b>classification</b> for 'Ingress Protection (IPXX)' for enclosures, used to house electrical switchgear and its <b>related parameters</b> . Explain failure modes if the enclosure fails to meet ingress of solids and liquids.	CO3 CO4	PO8 PO10	<b>4+2</b>	
	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.	CO1 CO3	PO5 PO3	<b>2+2</b>	
	c)	Why do we need a <b>robust</b> design? Describe <b>three</b> 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 <b>Reliability</b> of products?	CO1 CO4	PO5 PO10	<b>2+3+1</b> <b>+2+2</b>	

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