U.S.N.										

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

Autonomous Institute Affiliated to VTU

April 2025 Semester End Make-Up Examinations

Programme: B.E. **Semester: III**

Branch: Electrical and Electronics Engineering **Duration: 3 hrs.**

Course Code: 23EE3PCTDC **Max Marks: 100**

Course: Transformers and DC Machines

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)	Draw the complete phasor diagram of a single phase transformer under full load condition to a lagging load & explain.	CO1	PO1	**06**
	b)	With a neat circuit diagram discuss in detail how to perform OC & SC test on single phase transformer.	CO2	PO2	**08**
	c)	A 230/460 v single phase transformer has a primary resistance of 0.2 ohm and a reactance of 0.5 ohm and the corresponding values for the secondary are 0.75 ohm and 1.8 ohm respectively.Find the secondary terminal voltage when supplying 10 A at 0.8 power factor lagging.	CO1	PO3	**06**
		OR			
2	a)	Write a note on voltage regulation and its significance of a single phase transformer.	CO1	PO2	**06**
	b)	Analyze the performance of transformers by using Sumpner's test with relevant circuit diagram.	CO1	PO2	**08**
	c)	The following results are obtained on a 50 kVA, 2400/120V, transformer . OC test: 396W, 9.65 A,120V SC test:810 W, 20.8 A, 92 V. Determine i)The circuit constants ii) the η at full load at 0.8 pf leading iii)the approximate voltage regulation at 0.8 pf lagging	CO3	PO3	**06**
		UNIT - II			
3	a)	What is an Auto transformer? Derive an expression for saving of copper in auto transformer when compared to a two-winding transformer.	CO4	PO1	**06**
	b)	Explain the features of delta/delta and star/delta three phase connections. List out their advantages and disadvantages.	CO4	PO2	**08**
	c)	A 500kVA transformer with 0.01pu resistance and 0.05pu reactance is connected in parallel with a 250kVA transformer with 0.015pu resistance and 0.04pu reactance. The secondary voltage	CO4	PO3	**06**

			of each transformer is 400V on no load. Find how they share a load of 750KVA at power factor 0.8 lagging.			
			OR			
	4	a)	With a neat circuit diagram, explain the operation of ON load tap changer.	*CO4*	*PO2*	**06**
		b)	Two 100 kW single phase transformers are connected in parallel on both primary and secondary sides one transformer has an ohmic drop of 0.5% and a full load and an inductive drop of 8% at full load current. The other has an ohmic drop of 0.75% and inductive drop of 2%. Show how they will share a load of 180 kw at 0.9 power factor.	*CO4*	*PO3*	**08**
		c)	An autotransformer supplies a load of 3kW at 115 volts at UPF. If the applied voltage is 230V, calculate (i) The power transferred to the load a) Inductively b) Conductively (ii) kVA rating (iii) Calculate the currents in the different parts of the winding. % Saving of copper	*CO4*	*PO4*	**06**
			UNIT - III			
	5	a)	Explain internal and external characteristics of a DC shunt generator.	*CO4*	*PO2*	**10**
		b)	What is armature reaction? With neat figures explain the armature reaction in DC machines under normal working conditions.	*CO4*	*PO3*	**10**
			OR			
	6	a)	Explain the working principle of DC generator and derive an EMF equation of DC generator with usual notations.	*CO2*	*PO2*	**10**
		b)	A 110V DC shunt generator delivers a load current of 50A. The armature resistance is 0.2 ohm and the field circuit resistance is 55 ohms. The generator is rotating at a speed of 1800 rpm and has 6-poles. The armature has 360 lap wound conductors. Find i) No load voltage in the armature ii) Flux per pole (iii) induced voltage when speed is 1500rpm	*CO3*	*PO3*	**10**
			UNIT - IV			
	7	a)	What is meant by back EMF? Explain the significance of back EMF.	*CO3*	*PO2*	**06**
		b)	A DC shunt motor runs at 1000 rpm on 200V supply its armature resistance is 0.8 Ω and the armature current drawn is 40 amps. What resistance must be connected in series with the armature to	*CO3*	*PO3*	**08**

			reduce the speed to 600 rpm, the armature current remaining same? Neglect armature reaction			
		c)	With usual notation, derive an expression for torque developed in a DC motor.	*CO3*	*PO4*	**06**
			OR			
	8	a)	What is the necessity of starter for a D.C. Motor? Explain, with a neat sketch, the working of a 3- point D.C. Shunt motor starter.	*CO3*	*PO4*	**06**
		b)	A 220 V shunt motor with an armature resistance of 0.5 ohm is excited to give constant main field. At full load the motor runs at 500rpm and takes an armature current of 30A. If a resistance of 1.0 ohm is placed in the armature circuit, find the speed at (a) full-load torque (b) double full-load torque.	*CO3*	*PO4*	**08**
		c)	With usual notations, derive an expression, which shows that variable losses is equal to constant losses of DC Motor	*CO3*	*PO4*	**06**
			UNIT - V			
	9	a)	With a neat circuit diagram, explain the importance and procedure of conducting Swinburne's test on DC motor. List the advantages of this test. Show how the efficiency can be predetermined as i) Motor ii) Generator	*CO5*	*PO2*	**10**
		b)	With a neat circuit diagram explain the Hopkinson's test conducted on two identical DC shunt machines and how the efficiency of the machine running as a motor and generator are determined?	*CO5*	*PO2*	**10**
			OR			
	10	a)	Explain the field test applied to two similar DC series motors to determine their efficiency.	*CO5*	*PO2*	**10**
		b)	Two identical dc machines, when tested by Hopkinson's method gave the following data: i. Line voltage: 230V & Line current excluding the field current:30 A ii. Motor armature current: 230A iii. Field current 5A and 4A. The armature resistance of each machine is 0.025Ω calculate the efficiency of both the machines.	*CO5*	*PO2*	**10**

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