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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: V**

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

Course Code: 19EE5PCMC2 **Max Marks: 100**

Course: Electrical Machines - II

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)	With necessary equations and plots explain the Ta/Ia and N/Ta characteristics of DC series and shunt motors.	*CO1*	*PO1*	**08**
	b)	Discuss about commutation in a DC machines.	*CO1*	*PO1*	**06**
	c)	A 250 V, DC shunt motor takes 5 A on no load and runs at 1000 rpm. The total armature and shunt field resistances are 0.2 Ω and 250 Ω respectively. Determine the speed of the motor when load taking a current of 50 A and the armature reaction weakens the field by 3%.	*CO1*	*PO1*	**06**
		OR			
2	a)	Discuss about armature reaction in a DC generator with necessary diagrams.	*CO1*	*PO1*	**10**
	b)	A 4 pole generator supplies a current of 143 A. It has 492 conductirs on its armature (i) wave wound (ii) lap wound when delivering full load, the brushes are given an angle of lead of 10^0 (mechanical), calculate (a) the demagnetizing AT/pole (b) the field winding is shunt connected and takes 10 A. Also find the no of extra shunt field turns to neutralize demagnetization.	*CO1*	*PO1*	**10**
		UNIT - II			
3	a)	Explain with neat sketch about Swinburnes test on a DC machine. Also mention its advantage and disadvantage.	*CO2*	*PO2*	**10**
	b)	The Hopkinson's test on two similar shunt machines give the following full load data: Line voltage is110 V, field currents are 3 A and 3.5 A, line current 48 A, armature resistance of each machine is 0.035 Ω, motor armature current is 230 A. Calculate the efficiency of each machine assuming a brush contact drop of 1 V per brush.	*CO2*	*PO2*	**10**

			OR			
	4	a)	A DC shunt machine when run as a motor on no load takes 400W at 220V & runs at 1000rpm. The field current is 1A and armature resistance is 0.1 Ω. Calculate the efficiency when the machine is running (i) as a generator delivering 40A at 220V & (ii) as a motor taking 38A current from a supply of 220V.	*CO1*	*PO1*	**10**
		b)	Explain Hopkinson's test on two identical DC shunt machines. List out the advantages and disadvantages of the same.	*CO2*	*PO2*	**10**
			UNIT - III			
	5	a)	Distinguish with neat diagrams two different types of rotor used in synchronous machines.	*CO3*	*PO2*	**06**
		b)	Discuss about hunting in synchronous motors. Mention its causes and effects. Also explain a method used for the reduction of hunting in synchronous machines.	*CO3*	*PO2*	**08**
		c)	A 220 V, 24 pole, 3-phase alternator is running at 300 rpm. Find the no of stator conductor if the magnetic flux is 0.05 Wb/pole. The winding is full pitched and distribution factor is 1.	*CO3*	*PO2*	**06**
			OR			
	6	a)	Explain the principle of operation of Synchronous motors?	*CO3*	*PO2*	**06**
		b)	A 12 pole, 3 phase, 600 rpm, star connected alternator has 150 slots. There are 2 coil sides per slot and total 12 conductors per slot. If the flux per pole is 0.05wb, Determine (i) rms value of emf in a conductor. (ii) rms value of emf in a turn (iii) rms value of emf in a coil (iv) Per phase induced emf . Assume full pitch coils.	*CO3*	*PO2*	**08**
		c)	Derive the expressions for Pitch factor and distribution factor.	*CO3*	*PO2*	**06**
			UNIT - IV			
	7	a)	With necessary diagrams explain EMF method to determine voltage regulation of an alternator operating at lagging power factor.	*CO3*	*PO2*	**08**
		b)	Discuss about load sharing between two alternators operating in parallel.	*CO4*	*PO2*	**06**
		c)	Discuss about any one method of synchronizing a 3- phase alternator with the infinite bus.	*CO4*	*PO2*	**06**
			OR			
	8	a)	With a neat phasor diagram explain the method of determining voltage regulation of a salient pole alternator using slip test.	*CO3*	*PO2*	**10**
		b)	In a 50 kVA star connected, 440 V, three phase, 50 Hz alternator, the effective resistance is 0.25 Ω/phase. The synchronous reactance is 3.2 Ω/phase and the leakage reactance is 0.5 Ω/phase. Determine at rated load and unity power factor (i) Internal emf induced due to armature resistance and leakage reactance in phase and in line (ii) Induced emf in phase and in line (iii) Percentage regulation on full load	*CO3*	*PO2*	**10**

			(iv) Value of synchronous reactance which replaces armature reaction. Also draw the phasor diagram.			
			UNIT - V			
	9	a)	Describe about power angle characteristic with necessary circuit diagram and phasor diagram neglecting armature resistance. Also mark the steady state stability limit in the power angle characteristic plot.	*CO3*	*PO2*	**10**
		b)	Explain the effect of change in excitation at constant load for a synchronous motor connected to a busbar with phasor diagram.	*CO3*	*PO2*	**10**
			OR			
	10	a)	Explain the effect of change in prime mover input for generating mode of Synchronous machine	*CO3*	*PO2*	**10**
		b)	Two 50 MVA three phase alternators operate in parallel. The settings of the governors are such that the rise in speed from full load to no load is 2% in one machine 4% in the other, characteristics being linear in both cases. If each machine is fully loaded when the load is 100MW, what would be the load on each machine when the total load is 50MW?	*CO4*	*PO3*	**06**
		c)	Derive an expression for the synchronizing power neglecting the effect of Ra between two alternators connected in parallel.	*CO3*	*PO2*	**04**

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