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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Electrical and Electronics Engineering **Duration: 3 hrs.**
Course Code: 22EE5PCDSM **Max Marks: 100**
Course: DC & Synchronous 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)	With a neat sketch explain the construction of a DC generator mentioning the functioning of each part.	*CO1*	*PO1*	**07**
	b)	Discuss the effects of armature reaction in DC generator with necessary diagrams. Also suggest a method to reduce the effect of armature reaction.	*CO1*	*PO1*	**07**
	c)	A 250 V DC shunt motor has armature resistance of 0.25 Ω, on load it takes an armature current of 50 A and runs at 750 rpm. If the flux of the motor is reduced by 10 % without changing the load torque, find the new speed of the motor.	*CO2*	*PO1*	**06**
		OR			
2	a)	Discuss the process of commutation in DC machines. Which methods are adopted to improve the process of commutation?	*CO1*	*PO1*	**07**
	b)	Explain about any two methods of speed control in a DC series motor.	*CO1*	*PO1*	**06**
	c)	A 4 pole wave wound 220 V DC shunt generator has a full load current of 22 A and shunt field current of 2 A. Find per pole cross magnetizing ampere turn and demagnetizing ampere turn, if the brushes are given a lead of 2 commutator segments at full load. There are 111 commutator segments and 4 turns per coil. Find the additional field current required to neutralize the back ampere turn if the field winding has 600 turn per pole.	*CO1*	*PO1*	**07**
		UNIT - II			
3	a)	Explain with neat sketch, Hopkinson test for finding the efficiency of DC Machines as motor and generator.	*CO2*	*PO1, 2*	**08**
	b)	Discuss in brief about a direct method of testing a DC motor.	*CO2*	*PO1, 2*	**06**

		c)	When running on no load, a 400 V shunt motor takes 5 A. Armature resistance is 0.5 Ω and field resistance 200 Ω. Find the output of the motor and efficiency when running on full load and taking a current of 50 A. Also find the percentage change in speed from no load to full load.	*CO2*	*PO1, 2*	**06**
			OR			
	4	a)	Discuss about retardation test on a DC Motor. Also explain how stray loss component and moment of inertia are determined using this test.	*CO2*	*PO1, 2*	**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*	*PO1, 2*	**10**
			UNIT - III			
	5	a)	Revolving field is more suitable than revolving armature in a synchronous machine. Justify	*CO3*	*PO1, 2*	**06**
		b)	Discuss about different methods of starting of synchronous motor.	*CO3*	*PO1, 2*	**07**
		c)	A 3 phase, 16 pole alternator has 144 slots and 10 conductors per slot. Flux per pole is 0.03 Wb and speed is 375 rpm. The coil span is 5/6 of the pole pitch. Find (i) frequency of generated emf (ii) phase and line emf.	*CO3*	*PO1, 2*	**07**
			OR			
	6	a)	Derive an expression for induced EMF in an alternator after deriving an expression for synchronous speed.	*CO3*	*PO1, 2*	**10**
		b)	A 400 V, 50 Hz, delta connected alternator has $X_d = 0.1$ Ω and $X_q = 0.07$ Ω and Ra is negligible. The alternator is supplying 1000 A at 0.8 p.f. lagging. (i) Find the excitation emf by neglecting saliency & assuming $X_d = X_s$. (ii) Find the excitation emf taking into account of saliency.	*CO3*	*PO1, 2*	**10**
			UNIT - IV			
	7	a)	With necessary circuit diagram, phasor diagram and expressions explain about pre-determination of voltage regulation using ZPF method for a lagging power factor load.	*CO3*	*PO1, 2*	**10**

		b)	A 400 V, 50 Hz, delta connected alternator has $X_d = 0.1\ \Omega$ and $X_q = 0.07\ \Omega$. Resistance of the armature is negligible. The alternator is supplying 1000 A at 0.8 p.f. lagging (i) Find the excitation EMF by neglecting saliency and assuming $X_d = X_q$. (ii) Find the excitation EMF taking into account of saliency.	*CO3*	*PO1, 2*	**10**
			OR			
	8	a)	Describe about two bright and one dark lamp method of synchronizing a 3-phase alternator with the infinite bus. Mention the conditions need to be satisfied to synchronize a 3- phase alternator to the infinite bus.	*CO4*	*PO1, 2*	**10**
		b)	Two single phase alternator operating in parallel have induced EMFs on open circuit of 230 $\angle 0°$ and 230 $\angle 10°$ Volts and respective resistance of j2 Ω and j3 Ω. Calculate (i) current supplied by each alternator (ii) terminal voltage (iii) power delivered by each of the alternators to a load of impedance 6 Ω (resistive).	*CO4*	*PO1, 2*	**10**
			UNIT - V			
	9	a)	Derive the expressions for active and reactive power exchange between busbar and synchronous generator considering and neglecting the armature resistance. Also mention the condition at which maximum power occurs.	*CO4*	*PO1, 2*	**10**
		b)	Explain the effect of change in excitation at constant load for a synchronous generator connected to a busbar with phasor diagram.	*CO4*	*PO1, 2*	**10**
			OR			
	10	a)	With necessary diagram explain the concept of Power angle characteristics.	*CO4*	*PO1, 2*	**10**
		b)	With a phasor diagram discuss the effect of change in excitation at constant load for a synchronous motor connected to a busbar.	*CO4*	*PO1, 2*	**10**

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