CBCS SCHEME

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BEE304

Third Semester M.Tech. Degree Examination, Dec.2023/Jan.2024
Transformers and Generators

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Obtain the equivalent circuit of 1ϕ transformer referred to primary side.	6	L3	CO1
	b.	With usual notations derive the EMF equation of transformer	6	L3	CO1
	c.	5KVA, 500/250V, 50Hz single phase transformer gave the following readings OC test : 500V, 1A, 50W (LV side open) SC test : 25V, 10A, 60W (LV side shorted) Determine : i) The efficiency on full load, 0.8 lagging power factor ii) The voltage regulation on full load, 0.8 leading power factor iii) Draw the equivalent circuit referred to primary side and insert all the values in it	8	L3	CO1
		OR			
Q.2	a.	With a neat diagram, explain the types of transformer.	6	L2	CO1
	b.	The maximum efficiency at full load and unity power factor of a 1ϕ, 25KVA, 50Hz transformer is 98%. Determine the efficiency at i) 75% load, 0.9pf ii) 50% load, 0.8pf	6	L3	CO1
	c.	With the help of phasor diagram explain the operation of practical transformer on load.	8	L2	CO1
		Module – 2			
Q.3	a.	What is the need of parallel operation and mention the conditions to the satisfied for parallel operation of two 1ϕ transformers.	6	L2	CO1
	b.	Two transformers are connected in parallel to a load of $(2 + 1.5j)\Omega$. Their impedances in secondary terms are $z_1 = (0.15 + 0.5j)\Omega$ and $z_2 = (0.1 + 0.6j)\Omega$. Their no load terminal voltages are $E_1 = 207\angle 0^\circ$ V and $E_2 = 205\angle 0^\circ$ V. Find the power output and power factor of each transformer.	6	L3	CO1
	c.	Derive the expression for saving of copper in autotransformer compared to two winding transformer.	8	L3	CO1
		OR			
Q.4	a.	An autotransformer suppler a load of 5kW at 125V at UPF. If the primary voltage is 250V. Determine : i) Transformation ratio ii) Secondary current iii) Primary current iv) Secondary number of turns if total turns is 250 v) Power transferred inductivity vi) Power transferred conductivity	6	L3	CO1
	b.	Obtain the expression for load sharing during parallel operation of two transformers having same voltage ratios.	8	L2	CO1

	c.	List the differences between two winding transformer and Autotransformer.	6	L1	CO1
		Module – 3			
Q.5	a.	With the help of neat sketches, explain how the voltage regulation can be determined using EMF method from the O.C and S.C list.	8	L2	CO3
	b.	A 3ϕ, 8 pole, 50Hz, star connected alternator has 96 slots, with 4 conductors per slot. The coil pitch is 10 slots. If flux/pole is 60mwb. Find : i) Phase voltage ii) Line voltage.	6	L3	CO3
	c.	Write a note on Harmonics and method to minimize it.	6	L2	CO3
		OR			
Q.6	a.	Explain the armature reaction in alternator with leading, lagging and UPF vector diagrams.	6	L2	CO3
	b.	A 3ϕ star connected alternator is rated at 1600KVA, 13500V. The armature resistance and synchronous reactance are 1.5Ω and 30Ω respectively per phase. Calculate the % Regulation for a load of 1280kW at pf 0.8 lagging, 0.8pf leading, UPF.	6	L3	CO3
	c.	The open circuit and short circuit test readings for a 3ϕ star connected 1000KVA, 2000V, 50Hz synchronous Generator are Field current (A): 10, 20, 25, 30, 40, 50 OC terminal voltage (V): 800, 1500, 1760, 2000, 2350, 2600 SC Armature current (A): -, 200, 250, 300, -, - The armature effective resistance is 0.2Ω/ph. Draw the characteristic curves and estimate the full load percentage regulation for i) 0.8pf lagging ii) 0.8 if leading Using synchronous impedance method.	8	L3	CO3
		Module – 4			
Q.7	a.	What are the causes and effects of hunting in synchronous machine? How do you eliminate it.	6	L2	CO3
	b.	What are the conditions for synchronization of alternators and explain two bright one dark lamps method.	6	L2	CO3
	c.	Two parallel running alternators has emf of 1000V per phase. The synchronizing impedance per phase are $z_1 = (0.1 + j2)\Omega$ and $z_2 = (0.2 + j3.2)\Omega$. They supply a load of impedance $(2 + j1)\Omega$/ph. Find their terminal voltage, load current, power outputs for a phase divergence of 10° electrical.	8	L3	CO2
		OR			
Q.8	a.	Derive the equation for synchronizing power when 2 alternators are connected in parallel at no load.	6	L2	CO3
	b.	A 2MVA, 3ϕ 8 pole alternator is connected to 6000V, 50Hz busbar and has synchronous reactance of 4Ω/ph. Calculate synchronizing power and synchronizing torque/mechanical degree of rotor displacement at no load.	8	L3	CO2
	c.	Explain two reaction theory in relevant to salient pole alternator.	6	L2	CO3
		Module – 5			
Q.9	a.	With a neat block diagram, explain the basic components of WECS.	10	L2	CO4
	b.	Explain the construction parts of solar cell along with working principle.	10	L2	CO4
		OR			
Q.10	a.	Explain the basic photovoltaic system for power generation.	10	L2	CO4
	b.	List the advantages and disadvantages of WECS.	10	L1	CO4

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