CBCS SCHEME

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BEE304

Third Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
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.	With the help of phasor diagram explain the operation of practical transformer on load.	8	L1	CO1
	b.	A 5 KVA, 500/250 V, 50 Hz, 1-ϕ transformer gave the following readings. OC Test : 500 V, 1 A, 50 W (LV side open) SC Test : 25 V, 10 A, 60 W (LV side shorted) Determine: i) The efficiency on full load 0.8 lagging p.f. ii) Voltage regulation on full load 0.8 leading p.f iii) The efficiency on 60% of full load 0.8 leading p.f.	12	L2	CO1
		OR			
Q.2	a.	With a neat circuit diagram, explain in detail Sumpner's test for determining efficiency of transformer. Mention its advantages and disadvantages.	10	L3	CO1
	b.	In a Sumpner's test on two identical 1-ϕ transformers rated 500 KVA, 11/0.4 KV, 50 Hz the wattmeter reading on HV side is 6000 W and on LV side is 15000 W. Find the efficiency of each transformer on half full load of 0.8 p.f.	10	L4	CO1
		Module – 2			
Q.3	a.	With the help of a neat circuit diagram and phasor diagram. Explain the operation of a 3-ϕ star-delta transformer.	6	L1	CO2
	b.	Discuss the necessary condition for the parallel operation of 2-transformers.	6	L1	CO2
	c.	The primary and secondary voltages of an auto transformer are 230 V and 75 V respectively. Calculate the currents in different parts of the winding when the load current is 200 A. Also calculate the saving of copper.	8	L3	CO2
		OR			
Q.4	a.	What is an auto transformer? Derive an expression for the saving of copper in an auto transformer as compared to an equivalent 2-winding transformer	6	L3	CO2
	b.	Explain the working of tap changing transformer.	6	L3	CO2
	c.	Two 1-ϕ transformers share a load of 400 KVA at power factor of 0.8 lag. Their equivalent impedances referred to secondary winding are $(1 + j2.5)\ \Omega$ and $(1.5 + j3)\Omega$ respectively. Calculate the load shared by each transformer.	8	L3	CO2

		Module – 3			
Q.5	**a.**	Derive an equation for the emf induced in an alternator. Also derive expression for pitch factor and distribution factor.	**10**	**L1**	**CO3**
	b.	A 3-ϕ star connected alternator is rated at 1600 KVA, 13500 volts. The armature resistance and synchronous reactance are 1.5 Ω and 30 Ω respectively per phase. Calculate the percentage regulation for a load of 1280 KW at a p.f 0.8 lag, upf.	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	Name the various methods of determining the voltage regulation for a 3-ϕ alternator and describe any one method in detail.	**10**	**L4**	**CO3**
	b.	A 2300 V, 50 Hz, 3 - ϕ star connected alternator has an effective armature resistance of 0.2 Ω. A field current of 35 A produces a current of 150 A on short circuit and open circuit Emf 780 V (line). Calculate the voltage regulation at 0.8 p.f lagging and 0.8 leading for the full load current of 25 A.	**10**	**L4**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the synchronizing of 3 - ϕ alternator by lamps dark method and also mention disadvantages.	**6**	**L2**	**CO3**
	b.	Write a short note on power angle characteristics of an alternator.	**4**	**L2**	**CO3**
	c.	The 1 - ϕ alternators operating in parallel have induced emf's on open circuit of 230 $\angle 0°$ and 230 $\angle 10°$ volts and respective reactances of j2 Ω and j3 Ω. Calculate: i) Terminal voltage ii) Current iii) Power delivered by each of the alternators to a load of impedance 6 Ω (resistive).	**10**	**L3**	**CO3**
		OR			
Q.8	**a.**	Explain the concept of two reaction theory in a salient pole synchronous machine.	**10**	**L3**	**CO3**
	b.	Write a short note on capability curves of synchronous generator.	**5**	**L3**	**CO3**
	c.	What is hunting in synchronous machine? Explain the role of damper winding.	**5**	**L3**	**CO3**
		Module – 5			
Q.9	**a.**	Write a brief note on the following: i) Wind energy site selection consideration. ii) The nature of wind.	**10**	**L1**	**CO4**
	b.	Discuss the advantages and disadvantages of PV systems.	**10**	**L2**	**CO4**
		OR			
Q.10	**a.**	With a neat diagram, explain Horizontal and vertical axis wind generators and mention their advantages and disadvantages.	**10**	**L2**	**CO4**
	b.	Write a note on the following: i) Applications of solar cell systems ii) I.V. characteristics of a solar cell.	**10**	**L3**	**CO4**

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