

CBGS SCHEME - Make-Up Exam

BEE304

Third Semester B.E/B.Tech. Degree Examination, June/July 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
1	a.	With neat diagram, explain the types of transformer.	6	L2	CO1
	b.	With the help of phasor diagram explain the operation of practical transformers ON Load.	8	L2	CO1
	c.	The maximum efficiency at full load and unity power factor of a 1 - ϕ , 25 KVA, 50 Hz transformer is 98%. Determine the efficiency at i) 75% load, 0.9 pf ii) 50% load 0.8 pf.	6	L3	CO1

OR

2	a.	With neat circuit diagram, explain the necessity and procedure of Sumpner's test on transformers.	6	L2	CO1
	b.	5 KVA, 500 / 250 V, 50Hz single phase transformer gave the following readings: O.C. test : 500V, 1A, 50W (LV side open) S.C. test : 25 V, 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 pf. iii) Draw the equivalent circuit referred to primary side and insert all the values in it.	8	L3	CO1
	c.	With usual notations derive the EMF equation of transformer.	6	L3	CO1

Module – 2

3	a.	What is the need of parallel operation and mention the conditions to satisfied parallel operation of two single phase transformers.	6	L2	CO2
	b.	Obtain the expression for load sharing during parallel operation of two transformers having same voltage ratios.	8	L2	CO2
	c.	With a neat sketch, describe the constructional features of 3 - ϕ transformer.	6	L2	CO2

OR

4	a.	Derive the expression for saving of copper in auto- transformer compared to two winding transformer.	6	L2	CO2
	b.	Two transformers are connected in parallel to a load of $(2 + j 1.5) \Omega$ their impedances in secondary terms are, $z_1 = (0.15 + j 0.5) \Omega$ and $z_2 = (0.1 + j 0.6) \Omega$ 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.	8	L3	CO2
	c.	What is necessity of tap changing? Explain the process of on load tap changing in auto- transformer	6	L2	CO2

Module - 3

Module - 3					
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. test.	6	L2	CO3
	b.	A 3 ϕ 8 pole, 50 Hz star connected alternator has 96 slots with 4 conductors / slot the coil pitch is 10 slots. If flux / pole is 60 mwb. Find : i) Phase voltage ii) Line voltage	8	L3	CO3
	c.	Write a note on Harmonics and method to minimize it.	6	L2	CO3

OR

6	a.	With neat sketch, explain the construction and working of synchronous generator.	6	L2	CO3																			
	b.	Derive the expression for EMF Equation of synchronous generator.	6	L2	CO3																			
	c.	<p>A 3.5 MVA, star connected alternator ratio at 4160 V at 50 Hz has open circuit characteristics given by the following voltage:</p> <table> <tr> <td>Field Current (A) :</td> <td>50</td> <td>100</td> <td>150</td> <td>200</td> <td>250</td> <td>300</td> <td>350</td> <td>400</td> <td>450</td> </tr> <tr> <td>EMF (Volts) :</td> <td>1620</td> <td>3150</td> <td>4160</td> <td>4750</td> <td>5130</td> <td>5370</td> <td>5550</td> <td>5650</td> <td>5750</td> </tr> </table> <p>A field current of 200 A is found necessary to circulate full load current on short circuit of the alternator. Neglect resistance, find the regulation at 0.8 pf lagging using synchronous impedance method.</p>	Field Current (A) :	50	100	150	200	250	300	350	400	450	EMF (Volts) :	1620	3150	4160	4750	5130	5370	5550	5650	5750	8	L3
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EMF (Volts) :	1620	3150	4160	4750	5130	5370	5550	5650	5750															

Module – 4

7	a.	What are the causes and effects of hunting in synchronous machine? How do you eliminate it.	6	L2	CO4
	b.	Derive the equation for synchronizing power when 2 alternators are connected in parallel at no load.	6	L2	CO4
	c.	Two parallel running alternators has emf 1000 V/ phase. The synchronous impedance / phase are $z_1 = (0.1 + j 2) \Omega$ and $z_2 = (0.2 + j 3.2) \Omega$. They supply a load of impedance $(2 + j1) \Omega / \text{ph}$. Find their terminal voltage, load current power outputs for at phase divergence of 10° electrical.	8	L3	CO4

OR

8	a.	What are the conditions for synchronization of alternators and explain two bright one dark lamps method.	6	L2	CO4
	b.	Explain the two reaction theory in relevant to salient pole alternator.	6	L2	CO4
	c.	A 2 MVA, 3 - ϕ 8 pole alternator is connected to 6000V, 50 Hz busbar and has synchronous reactors of 4Ω /ph. Calculate synchronizing power and synchronizing torque mechanical degree of rotor displacement at no. load.	8	L3	CO4

Module – 5

9	a.	Explain the basic components of wind energy conversion systems with a suitable sketch.	10	L2	CO4
	b.	Explain the construction parts of solar cell along with working principle.	10	L2	CO4

OR

10	a.	Explain the basic photo voltaic system for power generation.	10	L2	CO4
	b.	List the advantages and disadvantages of Wind Energy Conversion System (WECS).	10	L2	CO4

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