Code: 23EE3302

II B.Tech - I Semester – Regular / Supplementary Examinations NOVEMBER 2025

DC MACHINES AND TRANSFORMERS
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours　　　　　　　　　　Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
  2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
  3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
  4. All parts of Question paper must be answered in one place.

BL – Blooms Level　　　　　　　　　　CO – Course Outcome

PART – A

		BL	CO
1.a)	What is the purpose of Yoke? Mention materials used to make Yoke.	L2	CO1
1.b)	What is commutation? How to achieve good commutation?	L3	CO2
1.c)	What is the necessity of starter?	L3	CO2
1.d)	What are the iron losses and how to minimize it?	L4	CO4
1.e)	Define the voltage regulation of a transformer.	L3	CO3
1.f)	Define all day efficiency.	L3	CO3
1.g)	Why Iron losses neglected in short circuit test?	L3	CO3
1.h)	What is the difference between Auto transformers and two winding transformers?	L3	CO3
1.i)	What advantages do the star connection over the delta connection?	L4	CO5
1.j)	What is the purpose of tertiary winding in a three winding transformer?	L4	CO5

PART – B

			BL	CO	Max. Marks
		UNIT-I			
2	a)	Derive emf equation of dc generator.	L3	CO2	5 M
	b)	The armature of a 6-pole generator has a wave winding containing 664 conductors. Calculate the generated e.m.f when flux per pole is 60 mWb and speed is 250 r.p.m. Find the speed at which the armature must be driven to generate an e.m.f of 550V if the flux per pole is reduced to 58 mWb.	L4	CO4	5 M
		OR			
3		What is armature reaction? Describe the effects of armature reaction on the operation of dc machine. How is armature reaction minimized?	L3	CO2	10 M
		UNIT-II			
4	a)	Derive the condition for maximum efficiency of a dc motor.	L3	CO2	5 M
	b)	With neat circuit diagram explain 4 point starter.	L4	CO4	5 M
		OR			
5	a)	What are the various methods of speed control of dc motors? Explain speed control of dc series motor by any one method.	L3	CO2	5 M
	b)	Explain the principle of Hopkinson's Test.	L4	CO4	5 M

		UNIT-III			
6	a)	Derive the EMF equation of 1-Φ Transformer from the fundamentals.	L3	CO3	5 M
	b)	A 33 KVA, 2200/220 V, 50 Hz single phase transformer has the following parameters. Primary winding (h.v side): $R_1 = 2.4\Omega$, $X_1=6\ \Omega$ Secondary winding (l.v side): $R_2= 0.03\Omega$, $X_2 = 0.07\Omega$. i) Find the primary resistance and leakage reactance referred to secondary. ii) Find the equivalent resistance and equivalent reactance referred to secondary.	L4	CO5	5 M
		OR			
7	a)	Discuss the effect of variation of frequency and supply voltage on losses.	L3	CO3	5 M
	b)	A 25 KVA, 2200/200V, 50 Hz transformer has maximum efficiency at 80% of full load. Its equivalent resistance and impedance are 0.012 p.u and 0.05 p.u. Determine the efficiency and voltage regulation at half of full load and 0.8 pf lag.	L4	CO5	5 M
		UNIT-IV			
8	a)	A 15 kVA, 2300/230 V, 50 Hz single phase transformer gave the following test data: Open circuit test: 2300 V, 0.21A, 50W Short circuit test: 47 V, 6 A, 160 W	L4	CO5	5 M

		i) Find the equivalent circuit referred to high voltage side. ii) Calculate the full load voltage regulation at 0.8 pf lagging. iii) What is the efficiency at half the rated load at unity power factor.			
	b)	Explain the conditions in detail that must be fulfilled for the satisfactory parallel operation of two single phase transformers.	L3	CO3	5 M
OR					
9	a)	Discuss the separation of core losses in single phase transformer.	L3	CO3	5 M
	b)	Two similar 200 kVA, single phase transformers gave the following results when tested by sumpner's test: Mains Wattmeter W_1 = 4kW, series wattmeter W_2 = 6 kW at full load current. Find out individual transformer efficiencies at full load, unity power factor.	L4	CO5	5 M

UNIT-V

10	Describe four possible ways of connections of three phase transformers with relevant relations between voltages and currents on h.v and l.v sides.		L4	CO5	10 M
OR					
11	a)	Explain the operation of on-load tap changing transformer.	L4	CO5	5 M
	b)	Discuss the parallel operation of Three phase transformers.	L4	CO5	5 M