Course Code: 23EE3T03

BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE

(AUTONOMOUS)

II - B.Tech I-Semester Supplementary Examinations (BR23), Mar - 2026

DC MACHINES& TRANSFORMERS (EEE)

Time: 3 hours Max. Marks: 70

Question Paper consists of Part-A and Part-B
*Answer **ALL** the question in **Part-A and Part-B***

PART–A (10X2 = 20M)

		Marks	CO	BL
1. a)	Define pole core and pole shoe in a DC machine.	(2M)	CO1	BL1
b)	List the different types of losses in a DC machine.	(2M)	CO1	BL1
c)	Define back EMF in a DC motor.	(2M)	CO2	BL1
d)	Define critical field resistance and critical speed of a DC generator.	(2M)	CO2	BL2
e)	Explain the purpose of conducting a short circuit test on a transformer.	(2M)	CO3	BL1
f)	Draw the phasor diagram of a single-phase transformer for lagging power factor load.	(2M)	CO3	BL2
g)	Explain the advantage of an autotransformer over a two-winding transformer.	(2M)	CO3	BL2
h)	State the conditions required for parallel operation of transformers.	(2M)	CO3	BL2
i)	State the purpose of tap-changing in transformers.	(2M)	CO4	BL2
j)	Explain why third harmonic components cancel in line voltages of a balanced three-phase system.	(2M)	CO4	BL2

PART–B (5X10 = 50M)

2.	Demonstrate the process of commutation in DC machines through the reversal of current in a coil.	10(M)	CO1	BL3
	(OR)			
3a.	An 8 pole generator has an output of 200A at 500V, the lap connected armature with 1280 conductors, 160 commutator segments. If brushes are advanced by 4 segments from the no-load neutral axis, Solve for ATd /Pole and ATc /Pole.	5(M)	CO1	BL3
b.	Derive the torque equation of dc motor.	5(M)	CO1	BL2
4a.	A 10 kW, 250 V DC shunt generator has total no-load rotational loss of 400 W. The armature circuit resistance and shunt filed resistances are 0.5 Ω and 250 Ω respectively. Calculate the shaft power input and the efficiency at rated load.	5(M)	CO2	BL3
b.	Explain the process of speed control of a DC shunt motor by armature voltage and field flux.	5(M)	CO2	BL2
	(OR)			
5.	Describe the Hopkinson's test for obtaining the efficiency of two similar shunt motors.	10(M)	CO2	BL3

6a.	Derive EMF equation of a single-phase transformer.	5(M)	CO3	BL2
b.	A single-phase transformer has 400 primary and 1000 secondary turns. The net cross-sectional area of the core is 60 cm2. If the primary winding be connected to a 50-Hz supply at 520 V, determine (i) the peak value of flux density in the core (ii) the voltage induced in the secondary winding.	5(M)	CO3	BL3
	(OR)			
7a.	In a transformer, the core loss is found to be 52 watts at 40 Hz and 90 Watts at 60 Hz, both losses being measured at the same peak flux density. Compute the hysteresis and eddy current losses at 50 Hz.	5(M)	CO3	BL3
b.	Draw the exact equivalent circuit of a transformer and describe briefly the various parameters involved in it.	5(M)	CO3	BL3
8	The following readings were obtained from O.C. and S.C. tests on 8 kVA 400/ 120V, 50 Hz transformer. O.C. Test: (l.v. side) : 120 V; 4 A; 75 W. S.C. Test: (h.v.side) : 9.5 V; 20 A; 110W . Obtain i) The equivalent circuit (approximate) constants, ii) Voltage regulation and efficiency for 0.8 lagging power factor load, and iii) The efficiency at half full – load and 0.8 power factor load.	10(M)	CO3	BL3
	(OR)			
9a.	Discuss the advantages and disadvantages of an auto transformer as compared to a two-winding transformer.	5(M)	CO3	BL2
b.	Two similar 200 kVA, 1-phase transformers gave the following results when tested by back- to-back method: W1 in the supply line, 4 kW, W2 in the primary series circuit, when full-load current circulated through the secondary, 6 kW. Calculate the efficiency of each transformer.	5(M)	CO3	BL3
10a.	Explain about the star-star, star-delta connections used in 3-phase connection of transformers. Discuss their advantages and disadvantages.	5(M)	CO4	BL3
b.	A 3-Phase transformer has a delta –connected primary and is supplied at 11000 V. The terminal voltage (line voltage) of the star – connected secondary at 0.8 power factor lagging is 400 V. The effective resistance and reactance drops are 1.5% and 6% respectively, Determine the approximate transformation ratio.	5(M)	CO4	BL3
	(OR)			
11	A Scott connected transformer is fed from a 6000 V, 2-φ system with a 440V, 3-φ system. The frequency is 50Hz, the gross core area is 300cm2, while the maximum flux density is to be about 1.2 Wb/ m2. Find the number of turns on each winding and the point to be tapped for the neutral wire on the 3-φ side. If the load is balanced on the one side of such a transformer, find weather it will also be balanced on the other side.	10(M)	CO4	BL3

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