

THE KAVERY ENGINEERING COLLEGE
(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025

Third Semester

Electrical and Electronics Engineering

EE3303 – Electrical Machines – I

Regulations - 2021

Duration : 3 Hrs

Maximum : 100 Marks

PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)

Q.No	Questions	BLT	CO	Marks
1.	Define Co-energy.	L1	1	2
2.	Why the operating point of the magnetic system is not selected in the saturation zone of B-H characteristics?	L2	1	2
3.	List the factors involved in the voltage buildup of a shunt generator.	L1	2	2
4.	Why fractional pitched winding is preferred over full pitched winding?	L2	2	2
5.	Why DC series motor is started with loading condition?	L2	3	2
6.	What is the significance of back EMF in a DC motor?	L2	3	2
7.	Define All day efficiency of a transformer.	L1	4	2
8.	Why transformers are expressed in kVA?	L2	4	2
9.	List the applications of auto transformer.	L1	5	2
10.	Differentiate two winding transformer and auto transformer.	L2	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)

Q.No	Questions	BLT	CO	Marks
11.	a i Explain the two different types of magnetic circuits with neat diagram.	L2	1	8
	ii When two coils are connected in series, their effective inductance is found to be 10H. When the connections of one coil are reversed, the effective inductance is 6H. If the coefficient of coupling is 0.6, calculate the self-inductance of each coil and the mutual inductance.	L3	1	8
	Or			
	b i Compare magnetic and electric circuit.	L2	1	8

	ii	An iron rod 1.8 cm diameter is bent to form a ring of mean diameter 25cm and wound with 250 turn of wire. A gap of 1mm exists in between the end faces. Calculate the current required to produce a flux of 0.6 mWb. Take relative permeability of iron as 1200.	L3	1	8
12.	a i	Derive the EMF generated in a DC generator.	L2	2	8
	ii	A 4-pole, lap connected DC machine has 540 armature conductors. If the flux per pole is 0.03 Wb and runs at 1500 RPM, determine the EMF generated. If the machine is driven as a shunt generator with same field flux and speed, calculate the line current if the terminal voltage is 400 V. Given the $R_{sh}=450$ ohm and $R_a=2$ ohm.	L3	2	8
		Or			
	b i	Discuss the open circuit and external characteristics of DC generator with a suitable experiment setup.	L2	2	8
	ii	In a 400 V DC compound generator the resistance of armature, series and shunt windings are 0.10-ohm, 0.05 ohm and 100 ohms respectively. The machine supplies 20 Nos. of resistive heater each rated 500 watts, 400 V. Calculate induced EMF and armature current when the generator is connected in short shunt and long shunt. Allow brush contact drop of 2 V per brush.	L3	2	8
13.	a i	Describe the working of a three-point starter with a neat sketch.	L2	3	8
	ii	A 230 V, DC shunt motor, takes an armature current at 3.33 A at rated voltage and at a no-load speed of 1000 RPM. The resistances of the armature circuit and field circuit are 0.3 ohm and 160 ohm respectively. The line current at full load is 40 A. Calculate the speed at full load and the developed torque in case the armature reaction weakens the no load flux by 4%.	L3	3	8
		Or			
	b i	Discuss a suitable test to predetermine the efficiency of a DC machine with necessary equations.	L2	3	8
	ii	A 220 V, DC shunt motor with an armature resistance of 0.4 ohm and a field resistance of 110 ohm drives a load, the torque of which remains constant. The motor draws from the supply, a line current of 32 A when the speed is 450 RPM. If the speed is to be raised to 700 RPM, what change must be affected in the value of the shunt field circuit resistance?	L3	3	8
14.	a	Elucidate the method of determining the efficiency of two identical transformers with a suitable circuit diagram.	L3	4	16
		Or			
	b	Obtain the equivalent circuit of a transformer using open circuit and short circuit test.	L3	4	16
15.	a	Explain about auto transformer and derive an expression between the weight of winding material of auto transformer and ordinary transformer.	L3	5	16

Or

- b Discuss the various types of three phase transformer with a necessary equations and circuit diagram. L3 5 16