

Reg.No.:



VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN

[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]

Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 80012

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2024

Third Semester

Electrical and Electronics Engineering

U23EE303 – ELECTRICAL MACHINES - I

(Regulation 2023)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels	K1 – Remembering	K3 – Applying	K5 - Evaluating
(KL)	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Illustrate singly excited and multi excited magnetic field systems.	2	K2	CO1
2.	What do you mean by dynamically induced EMF ?	2	K1	CO1
3.	Infer the conditions for voltage build up in a DC shunt generator.	2	K2	CO2
4.	How the critical field resistance of DC generator is determined from OCC?	2	K1	CO2
5.	Write the significance of back emf in DC motor.	2	K1	CO3
6.	Infer the significance of starters for DC motors.	2	K2	CO3
7.	What are the types of losses that occur in a transformer?	2	K1	CO4
8.	State the desirable and necessary conditions for parallel operation of a single-phase transformers?	2	K1	CO4
9.	Infer the need of an autotransformers.	2	K2	CO5
10.	Identify the applications of autotransformers.	2	K3	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.	Questions	Marks	KL	CO
11.	a) With neat sketch explain multiple excited magnetic field system in electromechanical energy conversion systems. Also obtain the expression for field energy in the system. (OR)	13	K2	CO1
	b) Derive an expression for co-energy density of an electromechanical energy conversion device.	13	K2	CO1
12.	a) A D.C. machine has 8 poles, a lap-connected armature with 960 conductors, and flux per pole is 40 mWb. It is driven at 400 r.p.m. calculate the generated e.m.f. If the armature is replaced by wave connected windings, evaluate the speed at which it should be driven to generate 400 V. (OR)	13	K5	CO2
	b) Explain the concept of armature reaction. How demagnetizing and cross magnetizing ampere-turns are calculated?	13	K2	CO2
13.	a) A 4 pole, lap wound D. C. motor has 540 conductors. Its speed is found to be 1000 r.p.m. when it is made to run light. The flux per pole is 25 mWb. It is connected to 230 V D.C. supply. The armature resistance is 0.8Ω . Calculate i. Induced e.m.f. ii. Armature current iii. Stray losses iv. Lost torque (OR)	13	K3	CO3
	b) Explain the torque vs. armature current characteristics, speed vs. torque characteristics, and speed vs. armature current characteristics of DC shunt and series motors.	13	K2	CO3
14.	a) A 600 kVA, single phase transformer when working at UPF. has an efficiency of 92% at full load and also at half load. Determine its efficiency when it operates at UPF. and 60% of full load. (OR)	13	K3	CO4
	b) Explain the principle of operation of a transformer and derive the e. m. f. equation of a transformer.	13	K3	CO4
15.	a) Draw the circuit and explain the principle of an autotransformer. Also derive the expression for the volume of copper of an autotransformer and compare the copper saving with two winding transformers. (OR)	13	K2	CO5

- b) Explain how 2 phase supply can be obtained from 3 phase supply using Scott connection with the help of phasor diagram. 13 K2 CO5

PART – C

(1 x 15 = 15 Marks)

- | Q.No. | Questions | Marks | KL | CO |
|--------|--|-------|----|-----|
| 16. a) | The magnetization curve points of a d.c. shunt generator running at 1000 r.p.m. is as follows: | 15 | K5 | CO2 |

Field current (A)	0.25	0.5	1.0	1.5	2.0	2.5	3.0
EMF (V)	36	72	138	188	225	250	270

Draw the OCC curve and evaluate the value of field resistance to provide 240 V on no-load. What inferences can be drawn from the OCC curve?

(OR)

- b) Draw the phasor diagram to represent conditions in a single-phase transformer supplying load at:
- Unity p.f.
 - Lagging p.f. and
 - Leading p.f.

What inferences can be drawn from the three phasor diagrams?