Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

B. Tech (Third Semester – Regular & Supplementary) Examinations, November 2025

23BELPC23001/23BEEPC23001 – Electrical Machines-I

(EE/EEE)

Time: 3 hrs Maximum: 70 Marks

Answer ALL questions

(The figures in the right-hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Describe the factors that can prevent a DC generator from building up voltage.	CO1	K2
b. Explain what happens when the direction of current at the terminals of a DC series motor is reversed.	CO2	K1
c. Analyze the design features adopted in commercial transformers to minimize magnetic leakage.	CO3	K2
d. Explain the vector diagram of a Dy11 three-phase transformer and state the phase relationship between primary and secondary voltages.	CO4	K2
e. How does an Electronic Speed Controller (ESC) control a drone motor?	CO5	K2

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. Explain the constructional details of DC generator	5	CO1	K2
b. A long shunt d.c. compound generator delivers 110 kW at 220 V. If ra = 0.01 ohm, rse = 0.002 ohm, and shunt field has a resistance of 110 ohms, calculate the value of the induced e.m.f.	5	CO1	K4
(OR)			
c. Explain magnetization characteristics of a DC shunt generator?	5	CO1	K2
d. A d.c. shunt generator has a full load output of 10 kW at a terminal voltage of 240 V. The armature and the shunt field winding resistances are 0.6 and 160 ohms respectively. The sum of the mechanical and core-losses is 500 W. Calculate the power required, in kW, at the driving shaft at full load, and the corresponding efficiency.	5	CO1	K4
3.a. Derive and interpret the equation for armature torque in a DC motor, showing its dependence on flux and armature current.	5	CO2	K3
b. A 220 V shunt motor takes a total current of 80 A and runs at 800 rpm. Shunt field resistance and armature resistance are 50 ohm, and 0.1 ohm respectively. If iron and friction losses amount to1600 W, find (a) copper losses (b) armature torque (c) shaft torque (d) efficiency	5	CO2	K4
(OR)			
c. Explain the characteristics of series and shunt type dc motor with its applications?	5	CO2	K3
d. A 4 pole, 32 conductors, lap-wound dc shunt generator with terminal voltage of 200 volts delivering 12 amps to the load has armature resistance 2 ohm and field	5	CO2	K4

	resistance of 200ohms. It is driven at 1000rpm. Calculate the flux per pole in the machine. If the machine has to be run as a motor with the same terminal voltage and drawing 5A from the mains, find the speed of the motor.			
4.a.	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, calculate (i) the peak value of flux density in the core (ii) the voltage induced in the secondary winding.	5	CO3	K4
b.	Draw and analyze the phasor diagram of a transformer under loaded condition without considering winding resistance and leakage flux (i) lagging-power-factor load and explain how the phase relations between all parameters.	5	CO3	K3
	(OR)			
c.	A single-phase transformer with a ratio of 440/110-V takes a no-load current of 5A at 0.2 power factor lagging. If the secondary supplies a current of 120 A at a p.f. of 0.8 lagging, estimate the current taken by the primary.	5	CO3	K4
d.	Draw and analyze the equivalent circuit of a transformer referred to the primary side, and explain how it is used to determine voltage regulation.	5	CO3	K3
5.a.	Draw and explain vector diagrams of Yd1 and Yd11. List its advantages and disadvantages.	5	CO4	K2
b.	Explain the characteristics and application of zig zag transformer.	5	CO4	K3
	(OR)			
c.	What types of connections can be used? What are their advantages and disadvantages?	5	CO4	K2
d.	Explain the Open-Delta (V-V) connection of a three-phase transformer and state its advantages and limitations.	5	CO4	K3
6.a.	Discuss the role of the electronic commutator, Hall-effect sensors, and inverter in the operation of BLDC motors. Illustrate with a neat diagram	5	CO5	K3
b.	Describe the advantages, challenges, and future scope of smart transformers in distributed energy systems.	5	CO5	K3
	(OR)			
c.	What is energy-efficient motors? Describe the design features that make them more efficient than standard motors.	5	CO5	K3
d.	Compare BLDC motors with conventional DC and induction motors	5	CO5	K3

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