R18

ANURAG Engineering College
(An Autonomous Institution)
II B.Tech II Semester Supplementary Examinations, December-2024
ELECTRICAL MACHINES - I
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 Hours   **Max. Marks: 75**

Section – A (Short Answer type questions)   (25 Marks)
Answer All Questions

		Course Outcome	B.T Level	Marks
1.	Mention the similarities and differences between series and shunt DC generators.	CO1	L1	2M
2.	Give reasons for why equalizer connections are used in lap-winding and dummy coils are used in wave-windings?	CO1	L2	3M
3.	Distinguish between internal and external characteristics of a DC generator.	CO2	L1	2M
4.	Explain why the magnetizing characteristic of a DC generator obtained with increasing values of field current departs from that obtained with decreasing values of field current.	CO2	L2	3M
5.	List the losses in a dc shunt motor.	CO3	L1	2M
6.	What are the advantages of Hopkinson's test over Swinburne's test and what are its limits?	CO3	L2	3M
7.	State why the core of a transformer should be made of magnetic material.	CO4	L1	2M
8.	Draw the equivalent circuit of a transformer with secondary quantities referred to the primary side.	CO4	L2	3M
9.	Which type of winding connection is preferred for three-phase transformers used in power systems?	CO5	L1	2M
10.	Discuss the relative merits and demerits of an autotransformer.	CO5	L2	3M

Section B (Essay Questions)
Answer all questions, each question carries equal marks.   (5 X 10M = 50M)

11. A)	Explain the function of a commutator in a dc machine for motoring and generating action with necessary diagrams.		CO1	L3	10M
		OR			
B)	In a 110-V compound generator, the resistances of the armature, shunt and the series windings are 0.06 Ω, 25 Ω and 0.04 Ω respectively. The load consists of 200 lamps each rated at 55 W, 110 V. Find the total electromotive force and armature current when the machine is connected (*i*) long shunt (*ii*) short shunt. Ignore armature reaction and brush drop.		CO1	L3	10M
12. A)	Draw the external characteristics of various types of DC generators in one figure assuming the same no-load terminal voltage. Discuss the nature of these characteristics and compare them.		CO2	L3	10M
		OR			

B)	The *OC* curve of a d.c. shunt generator for a speed of 1000 r.p.m. is given by the following table. Field current : 2.0 3.0 4.0 5.0 6.0 7.0 E.M.F. volts : 102 150 188 215 232 245 The shunt has a resistance of 37 Ω. Find the speed at which excitation may be expected to build up. The armature resistance of 0.04 Ω. Neglecting the effects of brush drop and armature reaction, estimate the p.d. when the speed is 1000 r.p.m. and the armature delivers a current of 100 A.		CO2	L3	10M
13. A)	Derive the equation for speed of a dc motor and hence suggest various methods of speed control.		CO3	L3	10M
	OR				
B)	A 200 V shunt motor has Ra = 0.1 Ω, Rf = 240 Ω and rotational loss 236 W. On full-load, the line current is 9.8 A with the motor running at 1450 rpm. Determine: i) the mechanical power developed ii) the power output iii) the load torque, and iv) the full-load efficiency.		CO3	L3	10M
14. A)	Derive the expression for efficiency of a transformer and hence deduce the condition for maximum efficiency.		CO4	L3	10M
	OR				
B)	A 100 kVA distribution transformer has a full-load loss of 4 kW, the losses being equally divided between iron and copper. During 24 h in a day the transformer operates on full load for 4 h, on half-load for 6 h, the output being negligible for the remainder of the day. Calculate the all-day efficiency of the transformer.		CO4	L3	10M
15. A)	Define an autotransformer. Clearly distinguish between a resistive potential divider and auto transformer.		CO5	L3	10M
	OR				
B)	A 200/100 V, single-phase transformer is rated 10 kVA. If this transformer is connected as an autotransformer across a 50-V supply, what is the maximum output voltage that can be obtained from this transformer? If the load current is now 8 A, determine the kVA output and the currents in the various parts of the system.		CO5	L3	10M