Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (S,FE) (FT/WP) (S2 PT) Examination December 2025/January 2026 (2019 Scheme)

Course Code: EET202

Course Name: DC MACHINES AND TRANSFORMERS

Max. Marks: 100 Duration: 3 Hours

Use graph sheets wherever necessary

PART A

(Answer all questions; each question carries 3 marks) Marks

1		Explain the function of equalizer rings in a lap wound DC machine.	(3)
2		Explain the functions of yoke and pole shoe of a DC generator.	(3)
3		Derive the emf equation of a DC generator.	(3)
4		Explain the purpose of compensating windings in DC machines.	(3)
5		Explain the necessity of starters for a DC motor.	(3)
6		List out two applications each of DC shunt, series and compound motors.	(3)
7		What is meant by voltage regulation of a transformer? For what type of load, you may get negative voltage regulation?	(3)
8		A 60 kVA transformer has iron loss of 550W and full load copper loss of 800W. Find the efficiency at full load, if the full load power factor is 0.7 lagging.	(3)
9		Write down the conditions to be satisfied for the parallel operation of three phase transformers?	(3)
10		What is the purpose of tertiary winding in three winding transformer?	(3)

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

11	a)	Write any four differences between wave winding and lap winding.	(4)
	b)	Draw the winding diagram of a DC machine with 6 poles, 18 slots progressive double layer lap winding. Also prepare the winding table.	(10)
12	a)	Explain the constructional details of DC machines with the help of a neat diagram.	(10)
	b)	Explain the need of dummy coils in DC machines.	(4)

Module -2

13	a)	What is armature reaction? Explain the effects of demagnetizing and cross	(6)

magnetizing components of armature reaction?

b) A shunt generator gave the following open circuit characteristics at a speed of 1500 rpm. (8)

I_f	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
E	10	60	120	160	200	230	245	260	275	285	300

Plot the OOC and calculate:

i. the emf to which the machine will excite at 1500 rpm, when the shunt field resistance is 400Ω

ii. the critical resistance at 1500 rpm.

14 a) Derive the condition for maximum efficiency in a DC generator. (5)

b) A 4 pole DC shunt generator with 780 wave connected armature conductors and running at 500 rpm supplies a load of 25 ohm resistance at a terminal voltage of 250V. The armature resistance is 0.25 ohms and field resistance is 250 ohms. Find (4)

(i) Armature current

(ii) Induced EMF

(iii) Flux per pole

c) Define commutation. Explain the process of commutation with neat sketches. (5)

Module -3

15 a) Draw and explain the electrical and mechanical characteristics of DC series motors. (6)

b) An 8 kW, 200V DC shunt motor takes 4A at no load when running at 800 rpm. The field resistance is 100 ohms. The resistance of armature at stand still gives a drop of 6 volts across the armature terminals when 12A was passed through it. Calculate (a) speed, (b) Torque in N-m and (c) Efficiency at full load condition. (8)

16 a) With neat diagrams, explain the speed control methods in DC shunt motors. (6)

b) With neat diagrams, explain how the Swinburne's test is conducted on a DC motor to predetermine the efficiency at full load condition when running as a generator. Also list out the advantages and disadvantages of this test. (8)

Module -4

17 a) Explain the principle of operation of a transformer. Also derive the emf equation of a single phase transformer. (4)

b) Draw the phasor diagrams of (i) an ideal transformer on no load and (ii) a practical transformer supplying leading power factor load. (6)

c) Define All-day efficiency of a transformer. How can you improve the All-day efficiency of a distribution transformer? (4)

18 a) A 200 / 400 V, 50 Hz, single phase transformer gave the following test results. (10)

OC (LV)	200 V	0.7 A	70W
SC (HV)	15 V	10A	85W

Find the parameters and draw the equivalent circuit of the transformer as referred to the low voltage side.

b) Why transformers are rated in KVA? (4)

Module -5

19 a) Derive an expression for the saving of copper in an autotransformer as compared to an equivalent two winding transformer. (6)

b) Write the differences between power transformers and distribution transformers. (4)

c) What is meant by vector groups? Write short note on Dy11. (4)

20 a) What is the need for parallel operation of transformers? List out the essential and desirable conditions to be satisfied for parallel operation of transformers. (7)

b) Discuss the operation of open delta (V-V) configuration of transformers with the help of winding connection diagram, phasor diagram and voltage relations. (7)

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