Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester B.Tech Degree (S, FE) Examination December 2023 (2015 Scheme)

Course Code: EE205

Course Name: DC MACHINES AND TRANSFORMERS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks. Marks

1		Explain the various phenomena of electromechanical energy conversion in rotating machines. Which are the torques involved in DC machines?	(5)
2		Derive the E.M.F equation of D C generator.	(5)
3		Explain how the speed of a D.C. Shunt motor can be varied both above and below rated speed.	(5)
4		With supporting phasor diagrams, derive the expression for secondary side voltage regulation of a transformer for lagging and leading power factor loads.	(5)
5		Define all day efficiency of a transformer. What steps are taken to improve the all day efficiency of a distribution transformer?	(5)
6		Differentiate between two winding transformer and auto transformer. Derive the expression for the savings of copper in an auto transformer.	(5)
7		Distinguish the vector groupings Yy0, Dd0, Dy1, Yd11 in three phase transformer connections.	(5)
8		What is the purpose of tertiary winding on transformer?	(5)

PART B

Answer any two full questions, each carries 10 marks.

9	a)	In a long shunt compound generator, the terminal voltage is 230 V when it delivers 150A. Determine (i) induced e.m.f (ii) total power generated by the armature. The shunt field, series field, diverter and armature resistance are 92Ω, 0.015Ω, 0.03Ω and 0.032Ω respectively.	(5)
	b)	Why equalizer rings are used with lap winding? Explain	(5)
10	a)	For a 6 pole DC armature with 16 slots having 2 coil sides per slot and single	(10)

turn coils, calculate the relevant pitches for a wave winding and draw the developed diagram.

11 a) The open circuit characteristics of a dc shunt generator running at 850 rpm is given below. (10)

If (A)	0	0.8	1.6	2.4	3.2	4
Emf (V)	0	28	57	76	90	100

Calculate:

i. emf to which the machine will excite, when the shunt field resistance is 22Ω

ii. emf when an additional resistance of 8Ω is included in the shunt field circuit

iii. shunt field resistance for a normal voltage of 100V

iv. Critical speed with shunt field resistance for a voltage of 100V

PART C

Answer any two full questions, each carries 10 marks.

12 a) Find the value of the step resistance in a 6-stud starter for a 5 h.p, 200V shunt motor. The maximum current in the line is limited to twice the full-load value. The total copper loss is 50% of the total loss. The normal field current is 0.6A and full-load efficiency is 88%. (5)

b) Distinguish between core and shell type transformer. (5)

13 a) With the aid of relevant mechanical characteristics, discuss the various applications of D.C. Shunt, Series and Compound motors. (6)

b) Why the rating of transformer in kVA not in kW? (4)

14 a) What is the importance of Swinburne's test? How do you predetermine the efficiency of a D.C Shunt machine using the above test? (4)

b) What is the principle of operation of a transformer? Derive the e.m.f. equation of a single phase transformer (6)

PART D

Answer any two full questions, each carries 10 marks.

15 a) Following data were obtained on a 20kVA, 50 Hz, 2000/200V transformer. (6)
Draw the approximate equivalent circuit referred to LV and HV side.
OC Test: 200V 4A 120W (LV Side) SC Test: 60V 10A 300W (HV Side)

	b)	List out the necessary and desirable conditions for parallel operation of two single phase transformers.	(4)
16	a)	Explain the working of off-load tap changing transformer with help of neat diagram.	(5)
	b)	Explain with neat circuit diagram and phasors, how a 2-phase supply can be obtained from a 3-phase supply.	(5)
17	a)	In Scott connection prove that the 3-phase currents will be balanced if the 2-phase currents are balanced. Assume upf load	(10)

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