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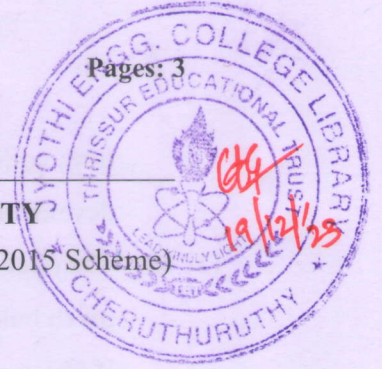
Pages: 3

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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)
