

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FOURTH SEMESTER B.TECH DEGREE EXAMINATION (R), MAY 2023 ELECTRICAL AND ELECTRONICS ENGINEERING (2020 SCHEME)

Course Code : 20EET202

Course Name: DC Machines And Transformers

Max. Marks : 100

Duration: 3 Hours

PART A

(Answer all questions. Each question carries 3 marks)

1. Distinguish single layer and double layer winding.
2. Why dummy coils are being used in DC machines?
3. What is compensating winding and why it is employed?
4. A 6 pole, wave connected armature has 250 conductors and runs at 1500 rpm. The emf generated on open circuit is 600V. Calculate the useful flux per pole.
5. Derive the condition for maximum power in a DC Motor.
6. Explain plugging of a DC Motor with suitable diagram.
7. Derive the condition for maximum efficiency of a single-phase transformer.
8. Why the power rating of a transformer is in kVA?
9. Explain the purpose of three winding transformer.
10. An autotransformer is used to transform 500V to 440 V. The load is 20kW at unity power factor. Neglecting losses and magnetizing current, find the currents in various parts of the winding.

PART B

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

MODULE I

11. Describe the construction of a DC machine using well-presented (14) illustrations.

OR

12. Create a winding diagram for a DC armature winding of the simplex lap type, specifically designed for a 4-pole configuration along with a winding table and ring diagram. The armature contains 16 slots and 16 commutator segments. (14)

MODULE II

- 13 The OCC of a dc generator driven at 400 rpm is as follows (14)

$I_f(A)$	2	3	4	5	6	7	8	9
$E(V)$	110	155	186	212	230	246	260	271

Find (i) The voltage to which the machine will excite when run as a shunt generator at 400 rpm with shunt field resistance equal to 34Ω .

(ii) Resistance of the shunt field circuit to reduce the OC voltage to 220V.

(iii) Critical value of shunt field resistance.

(iv) Critical speed when the field circuit resistance is 34Ω .

OR

14. a) Describe the concept of armature reaction and its consequences. (6)
 b) A 4-pole generator has wave wound armature with 722 conductors, and it delivers 100 A on full load. If the brush lead is 8° . Calculate the armature demagnetizing and cross-magnetizing ampere-turns per pole. (8)

MODULE III

15. a) Explain various speed control techniques of DC series motor. (8)
 b) A 500V shunt motor runs at its normal speed of 250 rpm when the armature current is 200A. The resistance of the armature is 0.12Ω . Calculate the speed when a resistance is inserted in the field, reducing the shunt field to 80% of normal value, and the armature current is 100A. (6)

OR

16. a) List the applications of DC shunt motors. (4)
 b) A 100kW, 500V, shunt generator was run as a motor on no-load at its rated voltage and speed. The total current taken was 9.5A, including a shunt field current of 2.5A. The resistance of the armature circuit is 0.1Ω at normal temperature. Calculate the efficiency of the generator at full load. (10)

MODULE IV

17. a) Derive the condition for maximum regulation of a single-phase transformer. (5)
 b) A 10kVA, 200/400V, 50Hz single phase transformer gave the following test results. (9)

OC test (HV winding open)	200V	1.3A	120W
SC test (LV winding short -circuited)	22V	30A	200W

Find the parameters of equivalent circuit as referred to LV winding.

OR

18. a) Draw the phasor diagram of a practical transformer on pure resistive load. (6)
- b) A 200kVA single phase transformer is in circuit continuously. For 8 hours in a day, the load is 160 kW at 0.8 pf. For 6 hours, the load is 80 kW at unity power factor and for the remaining period of 24 hours, it runs on no load. Full load copper losses are 3.02kW and the iron losses are 1.6 kW. Find all day efficiency. (8)

MODULE V

19. a) What is an auto transformer? Derive the expression for the saving of copper in an autotransformer as compared to an equivalent two winding transformer? (8)
- b) Explain the working of Off-Load tap changing transformer with help of neat diagram. (6)

OR

20. a) Explain the vector groupings Yy0, Dd0, Yd1, Dy1, Yd11, Dy11 in three phase transformers. (9)
- b) Compare Power Transformers and Distribution Transformers (5)
