Register No: …………………… Name: ....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)
(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)
FOURTH SEMESTER B.TECH DEGREE EXAMINATION(R,S), MAY 2024
Electrical and Electronics Engineering
(2020 SCHEME)

Course Code	:	**20EET202**
Course Name	:	**DC Machines And Transformers**
Max. Marks	:	**100** **Duration:3 Hours**

Scientific calculator is allowed in the examination hall.Provide ordinary graph sheet.

PART A
(Answer all questions. Each question carries 3 marks)

1. What is the purpose of the brush arrangement in a DC machine?

2. What advantages does a single-layer armature winding offer over a double-layer winding?

3. Enumerate the effects of armature reaction.

4. Discuss the various kinds of losses encountered in a DC generator.

5. Explain the various performance characteristics of a DC series motor.

6. Draw the power flow diagram of a DC motor.

7. Distinguish between core and shell type transformer.

8. Draw the equivalent circuit of a transformer referred to primary.

9. What is meant by vector group? What is Yd1 vector group?

10. Explain auto transformer with neat diagram.

PART B
(Answer one full question from each module, each question carries 14 marks)
MODULE I

11. a) The wave-connected armature of a 2-pole,200V generator has 400 conductors and runs at 300 rpm. Calculate the useful flux per pole. If the number of turns in each field coil is 1200, what is the average value of emf induced in each coil on breaking the field if the flux dies away completely in 0.15 seconds?   7

    b) Derive the equation of electromagnetic torque and comment on the factors affecting the torque.   7

OR

12. Generate a winding diagram that displays the arrangement of a progressive lap winding for a system with 4 poles and 24 slots. The diagram should exhibit a single coil side per slot, a single layer, and include the positioning of the poles and brushes, the direction of motion, and the induced emfs.   14

MODULE II

13. a) A 6 pole lap wound DC generator has 600 conductors on its armature. The flux per pole is 0.02 Wb. Calculate i) the speed at which the generator must be run to generate 300V. ii) What would be the speed if the generator is wave wound?   4

b) A 30kW, 300V DC shunt generator has armature and field resistances of 0.05Ω and 100Ω respectively. Calculate the total power developed by the armature when it delivers full load output. — 10

OR

14. The OCC of a DC generator driven at 400 rpm is as follows: — 14

If(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.

MODULE III

15. a) A 220 V, DC shunt motor has a no-load speed of 1500rpm, the line current being 5 A. When fully loaded, the line current is 30 A. If the shunt field resistance is 220Ω, and the armature resistance is 2.1Ω, calculate the full-load speed — 6

b) Describe with the aid of a circuit diagram, the Swinburne's test for estimating the efliciency of a DC shunt machine. What are the advantages and disadvantages of this method? — 8

OR

16. a) Derive the torque equation of a DC motor. — 4

b) What is the function of a starter in a DC motor? Explain the working of a three point starter with the help of neat diagrams. — 10

MODULE IV

17. The primary and secondary windings of a 500 kVA single-phase transformer have resistances of 0.4 Ω and 0.0015 Ω respectively. The primary and secondary voltages are 6000V and 400 V respectively and the iron losses are 3.2kW. Calculate the efficiency on i) full load ii) half load , assuming the pf of load as 0.8. — 14

OR

18. A 4 kVA,200/400V single phase transformer supplies full load current at 0.8 lagging power factor. The OC and SC test results are as follows. — 14

OC Test	200 V	0.8 A	70 W (LV side)
SC Test	20 V	10 A	60 W (HV side)

Calculate efficiency, secondary voltage, and primary current at the above load. Also, determine the load at unity power factor corresponding to maximum efficiency.

MODULE V

19. a) Explain the working of Off-Load tap changing transformer with help of neat diagram. — 10

b) Define dry-type transformer. — 4

OR

20. a) Discuss the construction details of a 3 phase transformer with diagrams. — 6

b) Explain the essential and desirable conditions for parallel operation of three phase transformers. — 8

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