C/L/TY

Final Assessment Test – November 2025

VIT
Vellore Institute of Technology

Course: BEEE215L - DC Machines and Transformers
Class NBR(s): 1049
Slot: G1
Time: Three Hours
Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

General Instruction: Non Programmable calculator is permitted : YES

COs	CO Statements
CO1	Apply the concept of rotating machines and the principle of electromechanical energy conversion in single and multiple excited systems
CO2	Analyze the output of DC machines and transformers and evaluate their performance
CO3	Test the performance of DC machines and transformers

BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)

Answer ALL Questions

(10 X 10 = 100 Marks)

1. Derive the expression for magnetic force and torque in double excited magnetic systems using energy and co-energy concepts. **CO1 BL2**

2. A separately excited generator, when running at 1000 rpm supplies 200 A at 125 V. What will be the load current when the speed drops to 800 rpm. If shunt field current is unchanged? Given that the armature resistance is 0.04 Ω and brush drop = 2 V **CO2 BL3**

3. What is the purpose of commutator? Explain the process of commutation and any one method for improving commutation. **CO2 BL2**

4. A 500 V DC shunt motor takes a current of 5 A on no load. The resistance of the armature and field circuit are 0.22 Ω and 250 Ω respectively. Find (a) the efficiency when the machine is loaded and taking a current of 100A (b) the percentage change in the speed. **CO3 BL3**

5. Why a DC series motor should never be started without load? Derive the torque equation for a DC motor and obtain the condition for achieving maximum torque. **CO2 BL2**

6. A single-phase, 10 kVA, 2000/200 V transformer is tested, and the following results are obtained. **CO3 BL3**

OC Test	Voc = 200V	Io = 3 A	Po = 400 W
SC Test	Vsc = 12 V	Isc = 50 A	Psc = 125 W

Using the above test data:

a) Determine the equivalent circuit parameters referred to the 200 V side.
b) Calculate the percentage voltage regulation at full load (10 kVA) with a power factor of 0.8 (lagging).
c) Compute the efficiency of the transformer at full load at 0.8 power factor (lagging).

7. Draw and explain the full load phasor diagram of single-phase transformer for lagging, leading and unity power factor loads. CO2 BL2

8. Explain any two methods of connection of three-phase transformers with voltage-current relation. Mention the advantages and disadvantages of the same. CO2 BL2

9.a) A 200 V DC shunt motor with constant main field drives a load, the torque of which varies at the square of the speed. When running at 600 rpm, it takes 30 A. Find the speed at which it will run and the current it will draw, if a resistor of 20 Ω is connected in series with the armature at the same given load condition. Neglect the losses. CO2 BL3

OR

9.b) A 15 kVA, 2000/200 V transformer has an iron loss of 250 W and full-load copper loss 350 W. during the day it is loaded as follows: CO2 BL3

No. of hours	Load	Power factor
9	¼ load	0.6
7	Full load	0.8
6	¾ load	1
2	No-load	-

Calculate the all-day efficiency.

10.a) The brushes of a 400 kW, 500 V, 6-pole D.C generator is given a lead of 12° electrical. Calculate the (i) demagnetizing ampere turns (ii) cross magnetizing ampere turns and (iii) series turns required to balance the demagnetizing component. The machine has 1000 conductors and leakage coefficient is 1.4 CO2 BL2

OR

10.b) Why starters are necessary? Explain in detail the construction and working of four-point starter. CO2 BL2

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