KUMARAGURU
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B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2018)

Third Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

U18EEI3201: DC Machines and Transformers

COURSE OUTCOMES

CO1: Apply laws of magnetic circuits to understand the performance characteristics of DC machines and its applications.

CO2: Conduct and analyze various testing procedures of DC generators and motors.

CO3: Analyze performance characteristics of transformers and its applications.

CO4: Conduct and analyze various testing procedures of transformers.

CO5: Select DC machines and transformers for various applications.

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	State Faraday's Laws of Electromagnetic Induction.	CO1	[K2]
2.	Define Critical Resistance of a DC Generator.	CO2	[K1]
3.	State the rule used to determine the direction of rotation of DC Motor.	CO1	[K2]
4.	Which speed control method is named as below rated speed control method in DC Motor and why?	CO2	[K1]
5.	Mention the different testing methods available to determine the performance of a DC Machine.	CO2	[K2]
6.	Why is the rating of transformers in kVA? Justify.	CO3	[K2]
7.	Can a transformer operate on DC? Justify.	CO3	[K2]
8.	List the applications of DC Series Motor.	CO5	[K2]
9.	Why is Sumpner's test named as Indirect Testing method?	CO4	[K2]
10.	State the application of Transformer.	CO5	[K1]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.		Elaborate the constructional features of a DC Machine with neat diagram. Also justify the choice of material for each part of the machine.	16	CO1	[K2]
12.	a)	Detail the principle of operation of a DC Motor. Also write the significance of Back EMF in the DC Motor.	10	CO1	[K2]
	b)	Derive the equation for gross torque developed in the DC Motor.	6	CO1	[K2]
13.	a)	Draw the power balance diagram of the DC generator and explain the different types of losses that takes place in DC Machine with suitable equation.	10	CO2	[K2]
	b)	In a DC Shunt motor the brake test was conducted and the full load readings are as follows: S_1=9.1kg, S_2=0.8kg, I=10A, Supply Voltage V=220V, Speed N=1320 rpm, radius of brake drum=7.5cm. Calculate its full load efficiency.	6	CO2	[K3]
14.	a)	Why are starters used for DC Motors and elaborate the working of Three Point Starter with neat diagram.	10	CO1	[K2]
	b)	A 4 pole, lap wound, DC generator has 672 armature conductors which was driven at a speed of 1120 rpm. If the useful flux per pole is 21mwb, calculate the generated EMF. Also find the speed at which it is to be driven to generate the same EMF when the armature conductors are wave wound.	6	CO2	[K3]
15.	a)	Draw and explain the phasor diagram of the transformer for different types of loading conditions.	10	CO3	[K2]
	b)	Derive the EMF equation of a Single-Phase Transformer.	6	CO3	[K2]
16.	a)	State the significance and working of Polarity Test in a single-phase transformer.	8	CO4	[K2]
	b)	Draw the equivalent circuit for a single phase 1100V/220V transformer which gives the following test results:	8	CO4	[K2]

OC Test	1100V	0.5A	55W on HV side	Secondary being open circuited
SC Test	10V	80A	400W on LV side	Primary being short circuited

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