Q. Code: 345818

Reg. No. | | | | | | | | | | | | | | | |

B.E / B.TECH. DEGREE EXAMINATION, MAY 2023

Third Semester

EE18303 – ELECTRICAL MACHINES-I

(Electrical and Electronics Engineering)

(Regulation 2018/Regulation 2018A)

TIME: 3 HOURS **MAX. MARKS: 100**

CO1 Analyze a magnetic circuit and determine the performance parameters.

CO2 Compute the performance parameters of a transformer and understand the function of the various special transformers.

CO3 Derive the force and torque of an electro-mechanical conversion device and analyze the performance.

CO4 Derive the characteristics and estimate the performance of DC generators.

CO5 Understand the necessity of Starting, controlling, braking, and the performance of different types of DC motors.

PART- A (10x2=20Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	What is dynamically induced emf?	**1**	**1**
2.	Compare electric and magnetic circuits.	**1**	**2**
3.	Why the transformers are rated in kVA?	**2**	**2**
4.	List the properties of an ideal transformer.	**2**	**2**
5.	Define energy and co-energy.	**3**	**1**
6.	Give an example for each of single and multiple excited system.	**3**	**2**
7.	State the conditions during which a DC shunt generator fails to excite.	**4**	**3**
8.	Specify the role of compensating winding in DC machine.	**4**	**2**
9.	Why DC series motor is always started with load?	**5**	**1**
10.	What is the significance of back emf in DC motor?	**5**	**2**

PART- B (5x 14=70Marks)

			Marks	CO	RBT LEVEL
11. (a)		Explain the two different types of magnetic circuits with neat diagram.	**(14)**	**1**	**2**
		(OR)			
(b)		Elaborate about the AC operation of magnetic circuit and derive the energy density expression.	**(14)**	**1**	**2**
12. (a)	**(i)**	Analyze the operation of a transformer with necessary vector diagram for leading power factor load.	**(7)**	**2**	**3**
	(ii)	Derive the condition for maximum efficiency in a transformer.	**(7)**	**2**	**3**
		(OR)			
(b)	**(i)**	Obtain the expression for copper saving when a single winding transformer is used.	**(7)**	**2**	**3**

	(ii)	A 200 kVA, single phase transformer has an efficiency of 98% at full load 0.8 p.f.lag. If the maximum efficiency occurs at three quarters full load, calculate the iron loss and full load copper loss.	**(7)**	**2**	**3**
13. (a)		Derive the expression for magnetic force developed in an electromagnetic relay of a single excited system.	**(14)**	**3**	**3**
		(OR)			
	(b)	Derive the expression for force developed in a magnetic system excited by more than one source.	**(14)**	**3**	**3**
14. (a)	**(i)**	Derive the emf equation of a DC generator.	**(7)**	**4**	**4**
	(ii)	A 10 pole DC shunt generator with 800 wave connected conductors are running at 600 rpm supplies a load of 15 Ω resistance at a terminal voltage of 240V. The armature resistance is 0.28 Ω and field resistance is 240 Ω. Determine the armature current, the induced emf and flux per pole.	**(7)**	**4**	**4**
		(OR)			
	(b)	Illustrate the effect of armature reaction in a DC generator. How is its demagnetizing and cross magnetizing ampere turns calculated?	**(14)**	**4**	**4**
15. (a)	**(i)**	Briefly explain the different methods of excitation of a DC motor with suitable diagrams.	**(10)**	**5**	**3**
	(ii)	A pole DC motor takes a 50 A armature current. The armature has lap connected 480 conductors. The flux per pole is 20mWb. Calculate the gross torque developed by the armature of the motor.	**(4)**	**5**	**4**
		(OR)			
	(b)	**(i)** Draw the diagram of a 3 point starter and explain its principle of operation.	**(7)**	**5**	**3**
		(ii) A 500 V, DC shunt motor takes a total current of 5 A when running unloaded. The resistance of armature circuit is 0.25 Ω and the field resistance is 125 Ω. Calculate the efficiency and output when the motor is loaded and draws a current of 100 A.	**(7)**	**5**	**4**

PART- C (1x 10=10Marks)

(Q.No.16 is compulsory)

			Marks	CO	RBT LEVEL
16.		Obtain the equivalent circuit of a single phase 1100/220 V transformer on which the following results were obtained.	**(10)**	**2**	**4**
	i)	1100 V, 0.5 A, 55 W on primary, secondary being open circuited			
	ii)	10 V, 80 A, 400 W on L.V. side, H.V. being short circuited.			
		Calculate the voltage regulation for the above transformer when supplying 100 A at 0.8 p.f. lagging.			