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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fifth Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; Feb. - 2021

Electrical Machines - II

Time: 3 hrs   Max. Marks: 100

Course Outcomes

The Students will be able to:

CO1: To know about basic operation and construction of different types of DC Generators.

CO2: To know about basic operation and construction of different types of DC Motors.

CO3: Analysis of various tests to be conducted on DC Machines.

CO4: To study about voltage regulation of synchronous generators.

CO5: To learn about principle of operation and the effect of load variation in synchronous motors.

Note: I) PART - A *is compulsory.* **Two** *marks for each question.*

II) PART - B: *Answer any* **Two** *sub questions (from a, b, c) for Maximum of* **18 marks** *from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
1 a.	Explain the EMF equation of DC shunt generator with suitable circuit diagram.	2	L2	CO1	PO2
b.	Explain the significance of back EMF in DC motors.	2	L2	CO2	PO2
c.	Mention the advantages of Hopkinson's test.	2	L1	CO3	PO2
d.	Define distribution factor of synchronous generator.	2	L1	CO4	PO2
e.	List the necessary condition for synchronization of alternators.	2	L1	CO5	PO2
	II : PART - B	**90**			
	UNIT - I	**18**			
1 a.	i) List the differences between lap and wave winding. ii) Derive the EMF equation of DC generator.	9	L1	CO1	PO2

b.	i) Write a note on EMF commutation.
	 ii) A 8 pole wave wound DC generator has 480 armature conductors. The armature current is 200 A. Find the armature reaction demagnetizing and cross magnetizing ampere turns per pole, if;
	    I) Brushes are on Geometric Neutral Axis (GNA)
	    II) Brushes are shifted 6° electrical from GNA
		9	L2
			
			 L3
				CO1
				
				 CO1
					PO2
					
					 PO2

c.	With relevant diagram, explain armature reaction in DC generator.	9	L2	CO1	PO2
	UNIT - II	**18**			
2 a.	Explain the speed-armature current characteristics and electrical characteristics of series and shunt DC motor.	9	L2	CO2	PO2
b.	Explain the following methods to control the speed of DC shunt motor: i) Flux control method ii) Applied voltage control	9	L2	CO2	PO2

c.	i) Why DC series motor is never started on No load?	2	L1	CO2 PO2
	ii) A 230 V DC shunt motor runs at 800 rpm and takes armature current of 50 A. Find resistance to be added to the field circuit to increase speed from 800 rpm to 1000 rpm at an armature current of 80 A. Assume flux proportional to field current. Armature resistance = 0.15 Ω and field resistance = 250 Ω.	7	L1	CO2 PO2

UNIT - III   **18**

3 a.	Describe briefly the field test applied to two similar DC series motor.	9	L4	CO3 PO2
b.	The Swimburne's test on DC shunt motor gave the following results: Line voltage = 500 V, takes 4 A on no load. The armature resistance including that of brushes is 0.2 Ω and the field current is 1 A. Estimate the output and the efficiency, when the input current is, i) 20A? and ii) 100 A?	9	L3	CO3 PO2
c.	Discuss in detail Hopkinson's test conducted on DC machine for pre determination of efficiency as generator and motor.	9	L4	CO3 PO2

UNIT - IV   **18**

4 a.	Discuss the comparison between the following in an alternator: i) Salient pole and non-salient pole ii) Full pitch and short pitch winding	9	L4	CO4 PO2
b.	Define voltage regulation and explain the synchronous impedance method to determine regulation of an alternator for lag and lead pf.	9	L2	CO4 PO2
c.	A 3.5 MVA, Y-connected alternator rated at 4160 V at 50 Hz has the OCC given by the following data:	9	L3	CO4 PO2

I_f (A)	50	100	150	200	250	300	350	400	450
V_{OC} inv (Line)	1620	3150	4160	4750	5130	5370	5550	5650	5750

A field current of 200 A is found necessary to circulate I_{FL} on SC of alternator. Calculate by; i) EMF method and ii) MMF method.

The voltage regulation at full load 0.8 pf lagging. Neglect resistance.

UNIT - V   **18**

5 a.	Explain the operation of synchronous motor at constant load and variable excitation.	9	L2	CO5 PO2
b.	Explain the slip test on salient pole synchronous machine with a neat circuit diagram and indicate how X_d and X_q can be determined from the load?	9	L2	CO5 PO2
c.	i) Explain the procedure of synchronization of 3 phase alternator. ii) *V*-curves and inverted *V*-curves of synchronous motor.	9	L2	CO5 PO2

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