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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; February / March - 2022

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 Gen.
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
	I : PART - A	**10**		
I a.	What is critical field resistance of a DC shunt generator? What is its significance?	2	L2	CO1
b.	Explain the necessity of a starter for a DC shunt motor.	2	L2	CO1
c.	Mention the applications of permanent magnet DC motor.	2	L1	CO3
d.	List out the factors influencing the induced emf of an alternator.	2	L1	CO4
e.	What are the necessary conditions for parallel operation of alternators?	2	L1	CO5
	II : PART - B	**90**		
	UNIT - I	**18**		
1 a.	What is armature reaction? What are its effects? Mention the methods to reduce those effects and explain any one of them.	9	L2	CO1
b.	What is the cause for sparking in the process of commutation in a DC machine? Mention the methods available for minimizing / eliminating sparking. Explain any one of them.	9	L2	CO1
c.	The brushes of 4 pole, 50 kW, 250 V wave connected DC generator are given a lead of 4 commutator segments. If the generator has 400 conductors, shunt field resistance of 50 Ω and delivers full load current, find; demagnetizing ampere-turns /pole and calculate extra shunt field turns/ pole to neutralize the demagnetization.	9	L3	CO1
	UNIT - II	**18**		
2 a.	With relevant fundamental relations, deduce the characteristics of DC series motor. Mention the applications of DC shunt motor.	9	L2	CO2
b.	Two series motor run at a speed of 500 rpm and 550 rpm respectively, when taking 50 A at 500 V. The terminal resistance of each motor is 0.5 Ω. Calculate the speed of the combination when connected in series and coupled mechanically. The combination is taking 50 A on 500 V supply.	9	L3	CO2

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c.	A DC series motor drives a load, the torque of which varies as the square of the speed. Assuming the magnetic circuit to remain unsaturated and the motor resistance to be negligible, estimate the percentage reduction in the motor terminal voltage, which will reduce the motor speed to half the value it has on full voltage. What is then the percentage fall in motor current?	9	L3	CO2

UNIT - III **18**

3 a.	Explain Swinburne's test to predetermine the efficiency of a DC shunt machine as both generator and motor.	9	L2	CO3
b.	It is required to determine the efficiency of two coupled DC series motors. Which test would you recommend and explain the same with circuit diagram.	9	L2	CO3
c.	The Hopkinson test on 2 similar shunt machines gave the following full load data; Line voltage = 240 V; field currents are 2 A and 3 A; line current excluding field currents = 16 A; armature resistance of each machine is 0.2 Ω; motor armature current = 71 A. Calculate the efficiency of each machine.	9	L3	CO3

UNIT - IV **18**

4 a.	I) Compare; (i) Full pitch winding and fractional pitch winding. (ii) Concentrated winding and distributed winding. II) State at least two advantages of revolving field type of alternator.	9	L2	CO4
b.	A 3ϕ star connected alternator is rated at 1600 kVA, 13500 V. The armature resistance and synchronous resistance are 1.5 Ω and 30 Ω respectively/phase. Calculate the percentage regulation for a load of 1280 kW at a PF of; i) 0.8 lag ii) 0.8 lead.	9	L4	CO4
c.	Define voltage regulation of an alternator. With relevant circuit diagrams, explain EMF method of determining the voltage regulation of cylindrical rotor alternator.	9	L2	CO4

UNIT - V **18**

5 a.	Using a suitable vector diagram, derive the expression for power development in a salient pole synchronous generator and there from deduce the power developed in a cylindrical rotor alternator.	9	L2	CO5
b.	With respect to synchronous motor, explain briefly; i) Starting torque ii) Running torque iii) Pull-in torque iv) Pull-out torque Mention the applications of synchronous motor.	9	L2	CO5
c.	With suitable diagrams, discuss the effect of variation of excitation of a synchronous motor with constant load.	9	L2	CO5

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