Code No: R2021024 **R20** SET - 1

II B. Tech I Semester Supplementary Examinations, July - 2022
DC MACHINES AND TRANSFORMERS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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1	a)	With neat sketch explain the multiple excited magnetic field system in electromechanical energy conversion systems. Also obtain the expression for field energy in the system.	[7M]
	b)	Derive the expression for generated e.m.f in DC generator.	[7M]

Or

2	a)	In an electromagnetic relay, functional relation between the current 'ί' in the excitation coil, the position of armature is 'x' and the flux linkage 'ψ' is given by $i = 2\psi^3 + 3\psi(1 - x + x^2), x > 0.5.$ Find force on the armature as a function of ψ.	[7M]
	b)	A long shunt compound generator supplies a load at 250V. The load consists of five motors each drawing 60A and a lighting load of 250 lamps at 100W each. The armature, series field and shunt field resistances are 0.01, 0.02 and 75Ω respectively. Find (i) load current (ii) armature current (iii) emf generated.	[7M]

3	a)	A 250V dc shunt motor takes 5A on no-load. The armature and field resistances are 1Ω and 125Ω respectively. Find its efficiency when it takes a line current of 25A.	[7M]
	b)	What is armature reaction? What are the effects of armature reaction on the performance of dc machine?	[7M]

Or

4	a)	A 460V dc series motor runs at 500 rpm taking a current of 40A. Calculate the speed and percentage change in torque if the load is reduced so that the motor is taking 30A. The total resistance of the armature and field circuits is 0.8Ω. Assume that flux is proportional to the field current.	[7M]
	b)	Discuss the effect of various losses in D.C Motor with equations. Deduce the condition for Maximum efficiency.	[7M]

5	a)	Draw the phasor diagram of a practical transformer under no-load condition. Name the no-load components and write its equation.	[7M]
	b)	Explain different methods of speed control of D.C shunt motor.	[7M]

Or

6	a)	Explain with diagram how Hopkinson's test is performed on D.C machines. What are the advantages and disadvantages of this test?	[7M]
	b)	Draw the exact equivalent circuit of a transformer and derive the equivalent circuits referred to primary and secondary. Describe the various parameters involved in it.	[7M]
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7	a)	A 10 kVA, 200/400V, 50Hz single phase transformer gave the following result. O.C test: 200V, 1.3A, 120W …….on L.V side S.C test: 22V, 30A, 200W …….on H.V side Calculate (i) The magnetizing current and the component corresponding to core loss at normal frequency (ii) The magnetizing branch impedances.	[7M]
	b)	The primary and secondary voltages of an autotransformer are 1200V and 600V respectively. Calculate the economy of Cu when the secondary current is 120A. Draw the circuit and show the current distribution in the winding.	[7M]

Or

8	a)	A 220kVA single phase transformer is in circuit continuously. For 8 hours in a day, the load is 60kW at 0.8 pf. For 6 hours, the load is 80kW at unity pf and for the remaining period of 24 hours it runs on no load. Full load copper losses are 3.02kW and the iron losses are 1.6kW. Find all day efficiency.	[7M]
	b)	Draw the circuit diagram of Sumpner's test and derive the equation for efficiency of each transformer.	[7M]
9	a)	Explain the open-delta connection with a suitable diagram. What are the uses of this connection?	
	b)	Explain how the Scott connection can be used to obtain two phase supply from a three phase supply?	[7M]

Or

10	a)	Explain the working of Off-Load tap changing transformer with help of neat diagram.	[7M]
	b)	What are the advantages and disadvantages of delta-delta connection?	[7M]