Code No: R1921022 **R19** SET - 1

II B. Tech I Semester Regular Examinations, March - 2021
ELECTRICAL MACHINES - I
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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1	a)	Draw the OCC characteristics of DC shunt generator and explain how to find critical resistance of DC Generators.	[8M]
	b)	The terminal voltage of a separately excited DC Generator with constant excitation is constant and is equal to 250 V. Determine the percentage reduction in speed when the load changes from 250 KW to 150 KW. The armature resistance is 0.05Ω and total contact drop at brushes = 2.2 V. Neglect armature reaction.	[7M]
		Or	
2	a)	Draw the internal and external characteristics of different types of DC generators and explain them.	[8M]
	b)	A 4-pole, 50KW, 250V wave wound, shunt generator has 400 armature conductors. Brushes are given a lead of 4 commutator segments. Calculate the demagnetizing ampere turns/pole if shunt field resistance is 50 Ω. Also calculate extra shunt field turns/pole to neutralize the demagnetization.	[7M]
3	a)	Draw different characteristics of shunt, series and compound motors.	[8M]
	b)	A 440V DC shunt motor is running at 1500rpm and it takes a line current of 30A. The output is 15HP. The load torque varies as the square of speed. Calculate the resistance to be connected in series with the armature for reducing the motor speed to 1300rpm.	[7M]
		Or	
4	a)	Explain the effects of Armature reaction and how can we reduce them.	[8M]
	b)	A 230 V DC Shunt motor takes 32 A at full-load. Find the back emf on full load if the resistances of motor armature and shunt field windings are 0.22 Ω and 120 Ω respectively.	[7M]
5	a)	With the help of neat sketch, explain the working of 3-point starter.	[8M]
	b)	Hopkinson's test on two similar DC shunt machines gave the following data: Line voltage 230V, line current excluding both the field currents is 40A, motor armature current 350A, field currents 5A and 4.2A. Calculate the efficiency of each machine. Armature resistance of each machine is 0.02Ω.	[7M]
		Or	
6	a)	Explain the procedure of conducting brake-test on DC machine with a neat circuit diagram	[8M]
	b)	A retardation test is made on a separately excited DC machine as a motor. The induced e.m.f. falls from 240 V to 175 V in 45 seconds on opening the armature circuits and 5 seconds on suddenly changing armature connection from supply to a load resistance taking an average current of 10A. Find the efficiency of the machine when running as a motor and taking a current of 25 A on a supply of 240V. The resistance of armature is 0.4 Ω and that of its field winding is 300 Ω.	[7M]
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7	a)	Discuss the working principle of single-phasetransformer and also explain the constructional details	[8M]
	b)	The voltage per turn of a single-phase transformer is 1.1V. When the primary winding is connected to a 220V, 50Hz A.C supply, the secondary voltage is found to be 550V. Find: i) Primary and secondary turns ii) Core area if the maximum flux density is 1.1 Wb/m^2.	[7M]

Or

8	a)	From the fundamentals, develop the exact equivalent circuit of a transformer.	[8M]
	b)	In a 50-kVA, 11-kV/400-V, single-phase transformer, the iron and copper losses are 500 W and 600 W, respectively under rated conditions. Calculate (a) the efficiency at unity power factor at full-load, (b) the load for maximum efficiency, and (c) the iron and copper losses for this load.	[7M]
9	a)	What are the advantages of poly-phase transformers? Give different configurations.	[8M]
	b)	A 10-kVA, 200-V/400-V, 50-Hz, single-phase transformer gave the following test results: OC test (HV winding open): 200 V, 1.3 A, 120 W. SC test (LV winding shorted): 22 V, 30 A, 200 W. Calculate (a) the magnetizing current, and (b) the equivalent resistance and leakage reactance as referred to the low voltage side.	[7M]

Or

10	a)	Explain the working of single-phase auto transformer with neat diagrams? Derive an expression for saving of copper in it when compared to ordinary two winding transformer?	[8M]
	b)	Two transformers A and B are connected in parallel to supply a load having an impedance of $(2 + j\ 1.5)\Omega$. The equivalent impedances referred to the secondary windings are $(0.15 + j\ 0.5)\Omega$ and $(0.1 + j\ 0.6)\Omega$ respectively. The open-circuit e.m.f. of A is 207 V and of B is 205 V. Calculate (i) the voltage at the load (ii) the power supplied to the load (iii) the power output of each transformer and (iv) the kVA input to each transformer.	[7M]

Code No: R1921022 **R19** SET - 2

II B. Tech I Semester Regular Examinations, March - 2021
ELECTRICAL MACHINES - I
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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1	a)	Distinguish between the external and internal characteristics of a DC Generator.	[8M]
	b)	Derive an expression for the e.m.f. generated in a DC machine?	[7M]
		Or	
2	a)	What are the reasons for a shunt generator not to build-up voltage? Explain the remedial measures.	[8M]
	b)	Explain the importance of armature, commutator and brush gear in a DC generator.	[7M]
3	a)	Derive the torque equation of DC motor?	[8M]
	b)	A 230V DC shunt motor takes 5A when running at no-load. The armature resistance is 0.2 Ω and field resistance is 115 Ω. For an input current of 72A, calculate the shaft output and efficiency. Also calculate the armature current at which the efficiency is maximum.	[7M]
		Or	
4	a)	Discuss armature reaction and commutation in DC motors. Explain their effects on the performance of the motor and give remedies to their effects.	[8M]
	b)	A 220V, 3.7KW DC motor operates at full load with 90% efficiency has constant losses 180W. Find the copper loss at full load. Also find the efficiency of motor at half-full load.	[7M]
5	a)	List the advantages of 4-point starter over 3-point starter? Draw and explain the4-point starter along with protective devices.	[8M]
	b)	A 400 V DC shunt motor takes 5 A at no-load. R_a=0.5 Ω and R_{sh}=200 Ω. Estimate the kW output and efficiency when the motor takes 50 A on full-load.	[7M]
		Or	
6	a)	Explain how the efficiency of two DC machines can be determined using Hopkinson's test? Draw the appropriate diagrams where ever necessary?	[8M]
	b)	Explain Speed control of DC motors by armature voltage and field flux control.	[7M]
7	a)	Define efficiency and regulation of a transformer. Show how the power factor affects both of them.	[8M]
	b)	The primary of a single-phase transformer takes 1 A at power factor of 0.4 when connected to a 240-V, 50-Hz supply and the secondary is on open circuit. The number of turns on the primary is twice that on the secondary. A load taking 50 A at a lagging power factor of 0.8 is now connected across the secondary. What is now the value of the primary current?	[7M]
		Or	
8	a)	Draw and explain the phasor diagram of single phase transformer on load considering with winding resistance.	[8M]
	b)	A single-phase, 100-kVA, 2000-V/200-V, 50-Hz transformer has impedance drop of 10 % and resistance drop of 5 %. (a) What is the regulation at full-load 0.8 power factor lagging? (b) At what power factor is the regulation zero?	[7M]

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9 a) Derive the equations for the currents supplied by each transformer when two transformers are operating in parallel with equal and unequal voltage ratios. [8M]

b) An autotransformer has a coil with total number of turns N_{CD} = 200 between terminals C and D. It has got one tapping at A such that N_{AC} = 100 and another tapping at B such that N_{BA} = 50. Calculate currents in various parts of the circuit and show their directions when 400 V supply is connected across AC and two resistive loads of 60Ω & 40Ω are connected across BC and DC respectively. [7M]

Or

10 a) With the help of neat sketch, explain in detail about parallel operation of single-phase transformers. [8M]

b) A 5KVA, 1000/200 V, 50 Hz single-phase transformer gave the following test results: [7M]

Open circuit test (LV side): 200 V, 1.2 A, 90 W

Short circuit test (HV side): 50 V, 5 A, 110 W.

Compute the parameters of approximate equivalent circuit referred to LV side.

Code No: R1921022 **R19** SET - 3

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Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
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1	a)	Explain the voltage build-up process in dc shunt generators. It is found that the voltage of a dc shunt generator does not build-up. Explain the various possible causes of this failure	[8M]
	b)	The terminal voltage of an 8-poleDCShunt generator with 780 wave connected armature conductors and running at 500 rpm is 240 V. The armature resistance is 0.24 Ω and the field resistance are 240 Ω. Find the armature current, the induced e.m.f. and the flux per pole if load resistance is 12 Ω.	[7M]
		Or	
2	a)	Explain the external characteristics for a shunt, series generator and compare them.	[8M]
	b)	A 4 pole, 220V DC shunt generator has armature and field resistances of 0.2Ω and 220Ω respectively. The armature has 520 conductors lap wounded. The machine runs at 1600 rpm. Find the generated e.m.f. and flux developed per pole.	[7M]
3	a)	Explain the significance of back emf in a dc machine.	[8M]
	b)	The armature of a 6-pole lap wound dc shunt motor takes 400 A at a speed of 350 rpm. The flux per pole is 80 mWb's, the number of turns is 600 and 3% of torque is lost in friction and iron losses. Calculate the brake horse power, back emf and supply voltage if armature resistance is 0.1 Ω.	[7M]
		Or	
4	a)	Sketch the speed-torque curve of a DC series motor and discuss its nature. What are the applications for DC series motors?	[8M]
	b)	A 250 V shunt motor has resistances 0.2 Ω and 250 Ω. The motor is driving a constant load torque and running at 1000 rpm drawing 10 A current from the supply. Calculate the new speed and armature current if an external armature resistance of value 10 Ω is inserted in the armature circuit. Neglect armature reaction and saturation.	[7M]
5	a)	List the methods of speed control of DC series motor, explain any one in detail.	[8M]
	b)	The following results are obtained during Hopkinson's test on two similar 230 V machines armature currents are 37A and 30A. Field currents are 0.85A and 0.8A, calculate the efficiencies of the machines if each has an armature resistance of 0.33Ω.	[7M]
		Or	
6	a)	Explain Hopkinson's test with its advantages and disadvantages.	[8M]
	b)	During Swinburne's test a 250V DC machine was drawing 3A from the 250V supply. The resistances are 250 Ω and 0.2 Ω. Find the constant loss of the machine. Also find the efficiency of the machine when it is delivering a 20A at 250V.	[7M]
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7	a)	Derive an e.m.fequation fortransformer with usual notation.	[8M]
	b)	The primary winding of a 50-Hz transformer has 480 turns and is fed from a 6400V supply. Determine (a) the peak value of the flux in the core, and (b) the secondary voltage if the secondary winding has 20 turns.	[7M]

Or

8	a)	Enumerate the losses in a loaded transformer. Derive the condition for maximum efficiency in a transformer	[8M]
	b)	A single-phase, 50-Hz transformer has 80 turns on the primary winding and 400 turns on the secondary winding. The net cross-sectional area of the core is 200 cm^2 . If the primary winding is connected to 240V, 50Hz supply, determine (a) the e.m.f. induced in the secondary winding, and (b) the maximum flux density in the core.	[7M]
9	a)	Derive an expression for the saving of copper in an autotransformer as compared to an equivalent two winding transformer.	[8M]
	b)	A 50 kVA, 2200/110 V transformer when tested gave the following results: OC test: 110 V, 10 A, 400 W SC test: 90 V, 20.5 A, 808 W Calculate % voltage regulation and efficiency at full load and 0.8 pf lagging.	[7M]

Or

10	a)	What is the significance of Y-Y, Y-delta and Delta-Y, Delta-Delta connections in 3-phase transformers?	[8M]
	b)	It is desired to transform 2400 V,500 kVA three-phase power to two-phase power 600 V by scott-connected transformers. Determine the voltage and current rating of both primary and secondary of each transformer. Neglect the transformer no load currents.	[7M]

Code No: R1921022 **R19** SET - 4

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ELECTRICAL MACHINES - I
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Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
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1	a)	With neat diagram explain the construction of DC generator.	[8M]
	b)	A 10 KW shunt generator having resistances1Ω and 100Ω, delivers full load at a terminal voltage of 230 V. Determine the efficiency of the generator at full load,assuming the iron, friction and windage losses amount to 500 W.	[7M]
		Or	
2	a)	Draw the load characteristics of DC shunt and series generators and explain the shape mentioning their applications.	[8M]
	b)	A 4-pole wave connected armature of a DC generator has 120 conductors and runs at 1200 rpm. If the flux per pole is 0.015 Wb, find the e.m.f. generated. Keepingthe flux constant, suggest a change in the armature of the generator so that thegenerator is capable to generate half of the no load voltage when running at thesame speed.	[7M]
3	a)	What is armature reaction in DC machines? What are its effects? Explain with relevant diagrams.	[8M]
	b)	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]
		Or	
4	a)	Draw and explain electrical and mechanical characteristics of DC shunt motor	[8M]
	b)	A 250V DC shunt motor has an armature resistance of 0.5 ohms and field resistance of 250 Ω. The motor draws 21A when driving a constant torque load at 600rpm. What will be the new speed of motor if an additional 250 Ω resistance is inserted in the field circuit?	[7M]
5	a)	How can the efficiency of a DC shunt motor be predetermined? Explain with circuit diagram and relevant calculations. Discuss the merits and demerits of this test.	[8M]
	b)	The maximum current during starting for a 500 V DC shunt motor is to be limited to 125 A. The resistance of the armature is 0.25 Ω. Find the resistance elements for a 12-element starter.	[7M]
		Or	
6	a)	Explain various methods for speed control of DC motors.	[8M]
	b)	What is the necessity of a starter for motor? With a suitable diagram, explain the Working of 3-point starter.	[7M]
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7	a)	Derive the condition for maximum efficiency of transformer. How the efficiency of a transformer depends on load?	[8M]
	b)	A 10-kVA, single-phase transformer has its primary connected to a 2000V supply. It has 60 turns on the secondary winding and voltage across it is found to be 240 V. Assuming the transformer to be ideal, calculate (a) the number of turns on its primary winding; (b) the full-load primary and secondary currents.	[7M]

Or

8	a)	Draw the phasor diagram of an ideal transformer on no-load. Also, draw a phasor diagram of a practical transformer supplying lagging power factor load.	[8M]
	b)	A 200-kVA, 3300-V/240-V, 50-Hz, single-phase transformer has 80 turns on the secondary winding. Assuming an ideal transformer, calculate (a) primary and secondary currents on full load, (b) the maximum value of flux, and (c) the number of primary turns.	[7M]
9	a)	Mention the different tests that are conducted on Transformer? Explain the procedure for conducting Sumpner's test along with all precautions to be taken while conducting the test with neat diagram.	[8M]
	b)	The test results of 2.5kVA, 230/115V single-phase transformer are as follows: OC Test : 115V, 1.2A, 60W SC Test: 12V, 10.86A. 120W Find: (i). Efficiency at 50% full-load, 0.8 power factor (ii) . Regulation at 30% full-load, 0.8 power factor lag and lead	[7M]

Or

10	a)	Explain in detail about Scott connection in a three-phase transformer.	[8M]
	b)	An autotransformer supplies a load of 5 kW at 110 V at unity power factor. If the applied primary voltage is 220 V, calculate the power transferred to the load (a) inductively and (b) conductively.	[7M]