KINGS
COLLEGE OF ENGINEERING

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK

SUBJECT CODE & NAME : EE 1202 - ELECTRICAL MACHINES – I

YEAR / SEM : II / III

UNIT-I

BASIC CONCEPTS OF ROTATING MACHINES

PART-A

1.Why do all practical energy conversion devices make use of the magnetic field as a coupling medium rather than an electric field? (2)
2.Write the applications of single excited and the doubly excited magnetic system. (2)
3.Explain the following terms with respect to rotating electrical machines (2)
a)pole pitch
b)chording angle
4.Write the equation which relates rotor speed in electrical and mechanical radians/second. (2)
5.Why the fields in rotating machines should be quasi-static in nature? (2)

PART-B

1.a)Explain why distributed field winding is employed in cylindrical rotor synchronous machine (6)
b) With neat sketch explain the multiple excited magnetic field system in electro mechanical energy conversion systems. Also obtain the expression for field energy in the system,(10)
2.a)Explain clearly how a rotating magnetic field is set up around the three phase AC winding having 120º (electrical) phase displacement each when three phase balanced supply is given to it.(8)
b) Obtain the torque equation for round rotor machine having P number of poles. State the assumptions made.(8)

3.a)Derive an expression for the RMS value of EMF induced in a coil of N turns in the presence of time varying flux.(8)
b)Draw and explain the general block diagram of an electromechanical energy conversion device(8)
4.Two coupled coils have self and mutual inductance of L_{11}=2+1/(2x); L_{22}=1+1/(2x): L_{12}= L21=1/(2x). Over a certain range of linear displacement x. The first coil is excited by a constant current of 20A and the second by a constant current of -10A.
(i)mechanical work done if x changes from 0.5to1m
(ii)energy supplied by each electrical source in part 1
(iii)change in field energy in part1
Hence verify that the energy supplied by the sources is equal to the increase in field energy plus the mechanical work done(16)

UNIT-II

DC GENERATOR

PART-A

1. What are the basic parts of a DC machine? (2)
2. Why is commutator employed in DC machines? (2)
3. Under what circumstances does a DC shunt generator failed to build up? (2)
4. Define critical field resistance and critical speed in DC shunt generator. (2)
5. Name any two applications of DC series generator. (2)
6. What are the effects of armature flux on the main field flux in DC machines? (2)
7. What is the purpose of providing compensating winding in DC machines? (2)
8. What is the function of Interpoles? (2)
9. What are the conditions to be satisfied before connecting two DC generators in parallel? (2)
10. What is commutation? (2)

PART-B

1. a)Describe with sketches the construction of a DC machine.(8)
   b)Derive the EMF equation of DC generator.(8)
2. Draw and explain the no-load and load characteristics of DC shunt, series and compound generators.(16)
3. Explain the effect of armature reaction in a DC shunt generator. How are its demagnetizing and cross-magnetizing ampere turns calculated?(16)
4. Explain the process of commutation in a DC machine.(16)

5. With a aid of a circuit diagram, describe the procedure for paralleling two DC shunt generators and for transferring the load from one machine to the other.(16)

6. A 4-pole, 50 kW, 250 V, wave wound shunt generator has 400 armature conductors. Brushes are given a lead of 4 commutator segments. Calculate the demagnetization ampere-turns per pole if shunt field resistance is 50 ohm. Also calculate extra shunt field turns per pole to neutralize the demagnetization.(16)
7. A 4-pole, lap connected DC machine has 540 armature conductors. If the flux per pole is .03 wb and runs at 1500 RPM, determine the emf generated. If this machine is driven as a shunt generator with same field flux and speed, calculate the line current if the terminal voltage is 400V.Given the R_{SH}=450Ώ and R_A=2 Ώ.(16)
8. Two separately excited DC generators are connected in parallel and supply a load of 200A. The machines have armature circuit resistances of 0.05 Ώ and 0.1 Ώ and induced emfs of 425V and 440V respectively. Determine the terminal voltage, current and power output of each machine. The effect of armature reaction is to be neglected.(16)

UNIT-III

DC MOTOR

PART-A

1. What is back emf in DC motors? (2)
2. Why is the starting torque of a DC series motor more than the DC shunt motor of same power rating? (2)
3. Why starters are used for DC motors? (2)
4. What is the difference between cumulative compound and differential compound motors? (2)
5. What is the function of a no-voltage release (NVR) coil provided in a DC motor starter? (2)
6. What does base speed mean? (2)
7. How does 4 -point starter differ from.. 3 point starter? (2)
8. List the different methods of speed control employed for DC series motors. (2)
9. What will be the effect of change in supply voltage on the speed of a DC shunt motor? (2)
10. Why DC series motor is not started at no load? (2)

PART-B

1.a) Explain the principle of operation of a DC motor.(8)
b)A shunt machine , connected to a 200V mains has an armature resistance of 0.15 Ώ and field resistance is 100 Ώ. Find the ratio of its speed as a generator to its speed as a motor, line current in each case being 75 A.(8)
2. a)Draw and explain the mechanical characteristics of DC series and shunt motors.(8)
b) A 230V, DC shunt motor, takes an armature current at 3.33A at rated voltage and at a no load speed of 1000RPM. The resistances of the armature circuit and field circuit are 0.3 Ώ and 160 Ώ respectively. The line current at full load and rated voltage is 40A. Calculate, at full load, the speed and the developed torque in case the armature reaction weakens the no load flux by 4%.
3.a)Describe the working of 3 point starter for DC shunt motor with neat diagram.(8)
b)Explain Ward-Leonard method of speed control in DC motors.(8)
4.a) Derive an expression for the torque developed in a DC machine.(8)
b) A 220V, Dc shunt motor with an armature resistance of 0.4 Ώ and a field resistance of 110 Ώ drives a load , the torque of which remains constant. The motor draws from the supply, a line current of 32A when the speed is 450RPM. If the speed is to be raised to 700RPM, what change must be effected in the value of the shunt field circuit resistance? Assume that the magnetization characteristics of the motor is a straight line.(8)

UNIT-IV

TRANSFORMERS

PART-A

1.Why transformer is rated in kVA? (2)
2.Mention the properties of oil used in the transformers. (2)
3.Why is autotransformer not used as distribution transformer? (2)
4.Under what value of power factor a Transformer gives zero voltage regulation? (2)
5. Mention the condition for maximum efficiency. (2)
6.Define all day efficiency of a transformer. (2)
7.What are the types of three phase transformer connections? (2)
8.Define the regulation up and regulation down of a transformer. (2)
9. What is meant by turns ratio in Transformer? Give any two advantages of auto Transformer. (2)
10.Give the function of conservator and breather in transformer? (2)

PART-B

1.a)Derive expressions for the current shared by two transformers operating in parallel, with unequal no load voltages.(8)

b)Draw and explain the no load phasor diagram of a single phase transformer(8)

2.a)Derive the emf equation of single phase transformer.(8)

b)A 120kVA, 6000/400V, Y/Y, 3-phase, 50Hz transformer has a iron loss of 1800W. The maximum efficiency occur at ¾ full load. Find the efficiency of the transformer at

(i) Full load and 0.8 pf

(ii)the maximum efficiency at unity pf. (8)

3. A 100 kVA, 6.6kV/415V, single phase transformer has an effective impedance of (3+8j) Ώ referred to HV side. Estimate the full load voltage regulation at 0.8 pf lagging and 0.8 leading pf.(16)

4.a)Explain the working of auto transformer and prove that when transformation ratio approaches unity, the amount copper used approaches smaller value.(8)

b)The emf per turn of a single phase, 6.6kV/440V, 50 Hz transformer is approximately 12V. Calculate the number of turns in the HV and LV windings and the net cross sectional area of the core for a maximum flux density of 1.5T.(8)

UNIT-V

TESTING OF TRANSFORMERS

PART-A

1. Why iron losses are considered as constant loss in Transformer? (2)
2. Give the purpose of conducting polarity test in transformers. (2)
3. Give the expression for load current when the transformer operates at its maximum efficiency. (2)
4. Define all day efficiency of a transformer. (2)
5. What are the advantages and disadvantges of sumpner's test. (2)

PART-B

1.obtain the equivalent circuit of a 200/400V,50Hz,single phase transformer from the following test data:
OC test: 200V,0.7A,70W on LV side
SC test: 15V,10A,85W on HV side (16)

2.Find the all day efficiency of a 500kVA, distribution transformer whose iron loss and full load copper loss are 1.5kW and 6kW respectively. In a day it is loaded as follows:

Duration(H_i)	Output(P_o) in kW	Power factor($\cos\varnothing_2$)
6	400	0.8
10	300	0.75
4	100	0.8
4	0	-

3. Draw the circuit diagrams for conducting OC and SC tests on a single phase transformer. Also explain how the efficiency and voltage resgulation can be estimated by these tests.

4.What is the sumpner's test ? Draw the circuit diagram to conduct this test and explain its principle.

5. Explain in detail about parallel operation of single phase transformers.