KEE – 401: ELECTRO-MECHANICAL ENERGY CONVERSION –I
Assignment of Unit-1

1. Explain the principles of electro-mechanical energy conversion in rotating machines.
2. Write short notes on the following:
   (i) Singly excited system.
   (ii) Doubly excited system.
3. What do you mean by "energy "& "co-energy" in magnetic system? Also mention its importance.
4. Give the physical concept of the following:
   (i) flux density wave sinusoidally distributed in space.
   (ii)pulsating stationary flux.
5. Describe the advantage of providing field winding on the rotor & armature winding on the stator in case of large 3Φ synchronous machines.
6. Derive the following relation for field energy.
   $W_f=\int_0^{\lambda} id\lambda$ where λ= flux linkage
7. Derive the relation for mechanical force developed for voltage control system.
8. For a certain relay , the magnetization curves for open & closed positions of the armature are linear. If the armature of the relay moves from open to closed positions at constant current show that the electrical energy input is shared equally between field energy stored & mechanical work done.
9. For a singly excited magnetic system, establish relationship between magnetic field energy & co-energy in terms of reluctance & permeance.
10. Explain the flow of energy in electro-mechanical devices with a suitable model & write energy balance equation.

KEE – 401: ELECTRO-MECHANICAL ENERGY CONVERSION –I
Assignment of Unit-2

1. Give the construction of DC machine in detail. What type of material we use in construction of dc machine.
2. Give the working principle of DC generator.
3. Explain the different types of DC machine with their circuit diagram.
4. What is armature reaction explain in detail.
5. What is commutation process? Give the type of commutation.
6. Explain the following term
   (a)Inter pole winding.
   (b)Compensating winding
7. Derive the emf. equation of a DC machine.
8. Explain voltage buildup process in case of DC shunt generator.
9. Explain the performance characteristic of following DC generator
   (a)Shunt generator
   (b)Series generator
   (c) Compound
10. Find the relation between electrical & mechanical degrees.
11. Derive the expression for flux per pole
12. Explain the effect of brush shifting.
13. Explain delayed commutation in brief.

14. What is lap & wave connection?
15. Explain general torque equation in dc machine.
16. The terminal voltage of a 8 pole dc shunt generator with 780 wave connected, armature conductors & running at 500 rpm at terminal voltage 240V .the generator has armature & field circuit resistance .24Ω & 240Ω respectively. Find armature current, generated emf in armature. Also find out the flux per pole if load resistance is 12Ω.
17. A separately excited dc generator has terminal voltage 250V with constant field excitation, if the load changes from 200kw to 225kw find the % change in speed. The armature resistance is .015 Ω & total contact drop at brushes is 2v. Neglect armature reaction .the flux & total no of armature conductor remain constant.

KEE – 401: ELECTRO-MECHANICAL ENERGY CONVERSION –I
Assignment of Unit-3

1. Explain why a starter is required for a DC motor. Describe a 3-point starter , having no volt & over - load protections for a DC shunt motor. What modification is made in a 4-point starter? Give the relative merits of these two types of starters.
2. Draw the the speed – torque characteristic of DC shunt , series & compound motors in same diagram & compare them. Which of the characteristic is more suitable for traction purpose & why?
3. The armature resistance of a 200V shunt motor is .4 Ω & no load current is 2A, when loaded taking armature current of 50A, the speed is 1200 rpm. Determine no load speed ignoring shunt field current.

KEE – 401: ELECTRO-MECHANICAL ENERGY CONVERSION –I
Assignment of Unit-4

1. Describe Sumner's test for determination of efficiency of transformer.
2. What is ALL-DAY efficiency & what is it's importance? For what type of transformer it is used.
18. Explain working of single phase autotransformer & it's application.
19. Show that there will be saving of copper in auto-transformer in comparison to same rating of two winding transformer.
20. In back to back test show that one transformer has slightly less temperature rise than other.
21. Explain why in testing large transformer the open circuit test is carried with the HV winding open & the short circuit test with LV winding shorted.
22. Show that in case of an auto-transformer :

$$\frac{Inductively\ transferred\ power}{Total\ power} = \frac{HV-LV}{HV}$$

23. In Sumpner's test ,reading of the wattmeter recoding the core losses, remain unaffected when low voltage is injected in the secondary series circuit explain;

24. Why the exciting current of single transformer contains harmonic even when the supply voltage is a sine wave.
25. Discuss the relative merits & demerits of an autotransformer.
26. Draw the phasor diagram of step down transformer, feeding a lagging power factor load.
27. Explain short circuit test. Why the core losses is assumed negligible in this test.
28. Define efficiency, voltage regulation, & all day efficiency. Derive the condition for max. Efficiency.
29. Find all day efficiency of the transformer having max. Efficiency of 98.5% at 20 KVA ,unity pf. & loaded as follows
    11 hours: 5 KW , .7 PF lag.
    6 hours: 8 KW, .8 PF lag.
    7 hours: no load
    the max. Efficiency of the transformer occurs at 80% of full load.
30. A 10 KVA, 2500/250 V, single phase two winding transformer is used as an autotransformer to raise the supply voltage of 2500V to an output voltage of 262V. The LV winding of two winding transformer consists of two equal parts of 125 V each .I both part of LV winding are used, determine autotransformer KVA output .Also calculate the KVA transformed & KVA conducted.

KEE – 401: ELECTRO-MECHANICAL ENERGY CONVERSION –I

Assignment of Unit-5

31. What do you understand by phasor group of three –phase transformer? Also mention its classification & significances. Explain the following in regarding with three phase transformers:
    (i) 3Φ to 2Φ connections (ii) 3Φ to 6Φ connections
32. Explain the working principle & constructional details of three winding transformer. Also mention the importance of third winding in the three winding transformer.
33. What do you mean by parallel operation of 3Φ transformer? Also discuss the excitation phenomenon & harmonics in 3Φ transformer.(2010)
34. Discuss the basic cause for the generation of harmonics in the transformer.
35. A three phase transformer bank consisting of three 1Φ transformer is used to step down the voltage of a 3Φ, 6600V transmission lines. If the primary line current is 10A, calculate the secondary line voltage, line current, & output KVA for Y/Δ connection. The turn ratio is 12. Neglect losses
36. Write all essential & desirable conditions to connect two 3Φ, transformer in parallel.
37. Draw the connection diagram for open delta system & show that
$$\frac{S\ open\ \Delta}{S\ closed\ \Delta} = \frac{1}{\sqrt{3}}$$
38. Two single phase transformers share a load of 400 KVA at .8 pf lagging. Their equivalent impedances referred to secondary windings are (1+J2.5) Ω & (1.5+J3) Ω respectively. Calculate the load shared by each transformer.
39. Discuss three –phase transformer phasor groups. How the displacement is expressed as the clock hour number.
40. Show the terminal connections of a 3-phase transformer with corresponding phasor diagram having the vector groups: Dy1 & yd11.

41. Explain Scott-connection.
42. Explain with suitable diagrams how harmonics are produced in transformers even when the supply voltage be purely sinusoidal. Which order of harmonics are usually prominent ? What is done to neutralize the effect of third harmonic voltages in high voltage Y-Y connected transformers?