Design of DC machine & Transformer
B.E. (Electrical- VI Semester)
Theory

General Aspects

[1] Write short note on classification of insulating materials.

OR

Prepare a technical note on classification of insulating materials.

[2] Define specific electric and specific magnetic loading. Also state advantages and disadvantages of these loadings

[3] Discuss the factors affecting the selection of specific magnetic and specific electric loadings in dc machine design

[4] Write a Short Note on : Duty Cycle

[5] Write electrical, mechanical and thermal property of insulating materials.

[6] Explain how temperature rise affects the life of electrical machine? Also explain Intermittent with starting duty cycle.

Design of Transformer

[7] Derive equation $\mathbf{Et = K\sqrt{Q}}$, where Q= KVA rating of transformer. Explain how service condition of transformer affects the value of K?

OR

Explain in brief the factors affecting the value of K in the expression of volt per turn in transformer design $\mathbf{Et = K\sqrt{Q}}$

[8] Answer the following questions w.r.t. Transformer design

(i) Explain the reason for using stepped core construction?

(ii) If a designer selects higher value of flux density what will be its effect on performance and cost of transformer?

(iii) Why tapings are usually provided on the HV winding side?

(iv) Why yoke is designed for low flux density?

(v) Why circular coils are preferred in transformer design?

[8] What is design optimization? Derive necessary condition for designing a transformer with minimum cost?

[9] Discuss the importance (Significance) of mittered joints in the core assembly of transformer?

[10] Explain effect of change in frequency on losses, voltage & leakage impedance of transformer.

[11] Derive the output equation of a three phase core type transformer?Write the significance of constant‘K’.

[12] Obtain the expression of leakage reactance of three phase core type distribution transformer?

[13] What is window space factor? How it varies with KVA and KV ratings? Explain role of it to improve transformer regulation? Also define Stacking factor?

[14] Explain the steps involved to calculate no load current of three phase transformer from its design data?

[15] Estimate the leakage reactance of concentric winding in core type transformers. Clearly stating the assumption used?

[16] Explain Design difference between power & distribution transformer.

[17] Transformer A and B are of same type and have equal current density, flux density, frequency and window space factor. Their linear dimensions are in the ratio of 2:1. Prove that their losses will be in the ratio of 8:1.

[18] Briefly explain cooling methods of transformer.

[19] List out diff. types of winding used in 3- phase transformer with its voltage rating. Also explain continuous disc type winding for 3- phase transformer

DC Machine Design

[20] Discuss the criteria for separation of D and L for dc machine.

[21] Discuss factors to be considered while deciding the length of air gap in the design of a dc machine.

[22] Explain how following factors influence the main dimensions of a dc machine.
(1) L/τ ratio
(2) Peripheral speed,
(3) Moment of inertia,
(4) Voltage between adjacent segments.

[23] Explain various factors affecting choice of Average flux density and Ampere conductors per meter for D.C. machine.

[24] Explain various factors affecting selection of number of poles for D.C. machine.

[25] Discuss the factors in brief how the number of poles affects the weight of iron and weight of copper in dc machine

[26] Explain how the choice of number of poles in a dc machine affects
(1) Losses in the machine (2) Weight of machine

[27] Explain various factors affecting selection of Numbers of armature slots for DC machine. Also show the slot view with insulations?

OR

Explain how following points affect the dimensions of slots in a dc machine armature design.
(1) Excessive flux density (2) Flux pulsations (3) Eddy current losses (4) Mechanical issues.

[28] Explain guidelines used for the selection of number of armature slots in dc machine design.

[29] State the factors to be considered while selecting the number of poles in the design of DC machine.

[30] Derive the output equation of a DC machine and explain its significance.

[31] List the various losses occurring in DC machine. Also derive the relationship between armature power developed (Pa) and the output power (P) for both- DC generator and DC motor.

[32] With the help of neat sketch, explain the effect of armature reaction on air gap flux in case of DC machine.

[33] Describe the different methods adopted to reduce the effect of armature reaction in DC machine.

[34] State the guiding factors while selecting the no. of armature slots in DC machine.

[35] Discuss design procedure for designing a commutator and brushes of a dc machine.

[36] Explain how pole body (shank) height is fixed while designing field system of a dc machine.

[37] Derive the expression of obtaining the number of coils of dc machine armature from design parameters.

OR

From Design parameters, derive the expression of determining no. of armature winding coils.

[38] Discuss the steps for designing a shunt field winding of a dc machine.

[39] Describe steps to calculate AT required for each part and total magnetic circuit of a dc machine.

[40] Explain Commutation in dc machine. Explain how interpole improves it?

[41] Define Field Form Factor. Explain Carter's Fringe Curve