Paper / Subject Code: 42203 / Electrical Machine Design

B.E. Electrical sem VII CBSGS 12/5/2019

Duration:- Three Hours **Total Marks : 80** (1/1)

NOTE

1. Question No 1 is Compulsory.
2. Solve any three out of the remaining.
3. Figure to the right side indicates marks.
4. Assume the suitable data and mention the same if required

Q1. Answer the following questions.

a. Explain different types of magnetic materials. [5]

b Discuss the choice of flux density for designing of transformer. [5]

c. Explain in brief the methods of cooling of a transformer. [5]

d. Discuss various insulating properties of transformer oil. [5]

Q2. a. Derive an output equation of single phase & three phase transformer. [10]

b. Determine the main dimensions and number of turns of a 100 KVA, 6600/ 440V, delta star connection, 50 Hz, 3 phase core types transformer with data, three step core arrangement, Emf per turn = 10 V maximum flux density: 1.3 wb /m2, current density : 2.5 A/mm2, window space factor = 0.3, stacking factor:0.9 over all height = overall width.. [10]

Q3. a.. Discuss designing of cooling tanks & tubes in a transformer. [10]

b. A 100KVA, 2000/400V, 50Hz, 1ph, Shell type transformer, has sandwich coils. There are two full hv coils, one full lv coil and 2 half lv coils. Calculate the value of leakage reactance referred to hv side. The data given is: depth of hv coil= 40mm, depth of lv coils= 36mm, depth of duct between hv and lv=16mm, width of winding= 0.12m, length of mean turn= 1.5m, the no of turns in hv winding are 200. [10]

Q.4.a. Discuss the various mechanical forces developed in transformer with sketches. Explain how they are taken care while fabrication. [10]

b. Derive the equation for leakage reactance calculation for a two winding core type transformer [10]

Q.5.a. Derive the output equation of a three phase Induction Motor in terms of main dimensions. [10]

b. Determine the main dimensions, total conductors and number of slot, area of a slot, conductor per slot for minimum cost design, for a 3.7 KW, 400v, 1410 rpm, 3 phase, 4 pole, 50Hz, delta connected, squirrel cage induction motor with the data average flux density in air gap = 0.45 Wb/m2, ampere conductor: 23, 000 A/ m, efficiency : 0.85, power factor : 0.84, winding factor 0.955, current density : 3.5 A/ mm^2, stacking factor = 0.9, slot space factor= 0.4. [10]

Q.6 a. Discuss various steps to be followed while designing a rotor of induction motor for main dimensions. [10]

b. Discuss the design modifications in a stator & rotor of an energy efficient motor. [10]

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