

BAPURAO DESHMUKH COLLEGE OF ENGINEERING, SEVAGRAM
DEPARTMENT OF ELECTRICAL ENGINEERING

Name of the Course: Electrical Machine Design

Course code: BEELE 503T

Semester: V Sem (CBS)

Branch: Electrical Engineering

Academic Year: 2021-22

Name of the Teacher: Prof. K. N. Sawalakhe

Assignment – I

1. Derive the expression of temperature rise of the machine when it is heated.
2. Explain the following duties for electrical machines.
 - i) Continuous duty
 - ii) Short time duty
 - iii) Intermittent duty
3. A transformer having temp. rise of 20°C after 1 hour and 32°C after 2 hours at continuous full load.
 - 1) What is the final steady state temp. rise on this load.
 - 2) If transformer is work on 50% overload how long will it takes to obtain same temp.- given that copper losses on full load equal to twice iron loss.
4. The rate of temp. rise as measured from a temp. rise time curve of a D.C. motor is 0.0803°C per minute and 0.0605°C per minute when temp – rise is 20.5°C and 28.5°C respectively. Calculate
 - i) Final steady temp rise.
 - ii) Heating time constant.
5. Derive an expression for output equation of 3 ϕ transformer.
6. Calculate the main dimensions of 125 kVA, 6.6 kV|400V, 50 Hz, single phase shell type transformer Assume :
Voltage per turn = 10 V
Flux density in core = 1.1 wb/m²
Current density = 2 A/mm²
Window space factor = 0.33
Stacking factor = 0.9
Ratio of $\frac{\text{Height of window}}{\text{Width of window}} = 3$
Ratio of $\frac{\text{Depth}}{\text{Width of Central Limb}} = 2.5$
Also calculate number of turns and area of cross-section of conductors.
7. With reference to transformers, write short notes on :
 - i) Choice of Flux Density.
 - ii) Choice of Current Density.
8. Determine the main dimensions of the core, the number of turns and the area of conductors for a 5 kVA, 50 Hz 11000/400V, 1-phase core type distribution transformer. The net conductor area in the window is 60% of the net cross-section (square) of the iron core. Assume a flux density of 1 wb/m², a current density of 1.4 A/mm² and a window space factor of 0.2. The window height is 3 times its width.
9. Write short notes on any three.
 - i) Properties of Transformer oil.
 - ii) Continuous and short time Rating.
 - iii) Classification of Insulating Material.
 - iv) Need of stepped core cross section.

10. Estimate the main dimensions of core, no. of turns and cross-sectional area of conductor of primary and secondary winding of a 300kVA, 11KV / 440V, 3- ϕ , Δ / γ connected core type 50Hz distribution transformer. The following data is given.

Ratio of voltage per turn to square root of kVA rating is 0.45, winding space factor = 0.3,

Stacking factor = 0.9, Maximum flux density = 1.2 wb/m², current density = 2.5 A/mm²

Hw/ww = 3, Ai = 0.6 d².