Printed Pages : 4

EEE023

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : **120653**

Roll No.

B. Tech.

(SEM. VI) THEORY EXAMINATION, 2014-15

CONVENTIONAL AND CAD OF ELECTRICAL MACHINES

Time : **2** Hours] [Total Marks : **50**

Note : Attempt **all** questions. **Each** question carries equal marks.

1 Attempt any four parts of the following. (5×4=20)

(a) What are the desired properties of the magnetic materials used in electrical machines ?

(b) What is the effect of class of insulating materials used in electrical machine ?

(c) What is dielectric loss, loss angle and power factor? Explain with the help of equivalent circuit and phasor diagram.

(d) Define electrical and magnetic specific loading. What are their importance in design of Electrical machines ?

(e) Discuss the type of cooling, of electrical machines according their rating.

(f) What are the desired properties of the magnetic materials used in electrical machines ?

2 **Attempt any two parts of the following.** **(5×2)**

(a) Explain heating and cooling time constant. The temperature rise of a transformer is 35°C after one hour and 47.5°C after two hours of starting from cold conditions. Calculate its final steady temperature rise and the heating time constant. If its temperature falls from the final steady value to 40°C in 2.0 hour when disconnected. Calculate its time constant. Assume ambient temperature as 25°C.

(b) What are the important specifications required to design a transformer? Design a 300 kVA, 11000/440 V, 50 Hz, 1-phase, core type, oil immersed, self cooled, power transformer with following data :
Induced E.M.F. per turn = 20 V
Max. Flux density in the core = 1.2 Wb/m^2
Current density = 2.5 A. mm^2
Window space factor = 0.4
Ratio of window height to window width = 3
Determine main dimensions of core and yoke.

(c) What are the factors affecting total M. M. F. of electrical machine ? Deduce the expression for the slot permeance of a semi-closed rectangular slot. Then find the slot leakage reactance of an induction motor having single layer winding with 225 turns per phase accommodated in 18 slots per phase. The slot dimensions in mm are :-
Slot width = 10
Conductor height = 30
Clearance between wedge and conductor = 1.0
Wedge height = 3.25
Lip height = 1.2
Lip opening = 3
Slot Length = 200

3 **Attempt any one part of the following.** **(10×1)**

(a) Show that the specific electrical loading of a rotating machine is constant provided the current density, ratio of conductor to slot area, ratio of slot width to slot pitch and the slot depth area are constant.

(b) Calculate the main dimensions, turn per phase, number of slots, conductor cross-section and slot area of 250-h.p., 3-phase, 50 Hz, 400V, 1460 rpm, delta connected, slip-ring induction motor. The data are given as follows :

B_{av} = 0.5 Wb/m^2, ac = 30000 A/m;

Efficiency = 90%, power-factor = 80%;

Winding factor = 0.955;

Current density = 3.5 A/mm^2;

Slot space factor = 0.4;

Ratio of core length to pole-pitch = 1.2

4 **Attempt any one part of the following.** **(10×1)**

(a) Design a suitable values of diameter and length of a 100 MVA, 11 kV, 50 Hz, 3000 r. P. M., 3-phase, star-connected alternator. Also determine the value of flux, conductor per slot, number of turns per phase, and size of armature conductor.

The data are given as follows:

Average gap density = 0.6 Tesla

Ampere conductor per m = 50,000

Peripheral speed = 180 m/sec

Winding factor = 0.95

Current density = 6 A/mm^2

(b) Draw a flow chart and make a program to determine main dimensions, stator slots, conductor per slot, and winding details of a 3-phase alternator. Mention the input data required in the programme.