Unit - V

5. a) Why the length of air gap in a 3 phase induction motor is kept minimum possible where as in a DC machine, it is larger?

   b) Show that the size and hence cost of machine decreases if increased value of specific loadings are used.

   c) How rotor bar current is determined in a 3 phase induction motor?

   d) Discuss briefly different factors which are taken into account while designing the rotor for a 3 phase slip ring induction motor.

OR

Determine the diameter and length for a 3 phase, 120kw, 2200 volts, 50Hz, 750rpm (synchronous speed). Slip ring induction motor from the following data:

B = 0.48 Tesla, ac = 2600 ampere conductor per meter, efficiency = 92%, power factor = 0.88, L = 1.25 times pole pitch, $k_w = 0.955$.

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Total No. of Questions :5] *[Total No. of Printed Pages : 4*

Roll No

EE - 603

B.E. VI Semester

Examination, June 2016

Electrical Machine Design

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

1. a) Explain various latest trends in design of electrical machines.

   b) Differentiate between analysis and synthesis method of computer aided electrical machine design.

   c) Explain Non linear programming method.

   d) Explain the terms "Constrained optimization" and "Unconstrained optimization" with examples.

OR

Discuss in brief various factors imposing limitations on design of electrical machines.

Unit - II

2. a) Mention the advantages and disadvantages of choosing large number of poles in DC machines.

   b) Design series field winding in DC machine.

   c) Explain briefly four factors which control the length of the air gap in DC machine.

   d) Derive the output equation relating main dimensions of a DC machine.

OR

Discuss the factors to be considered while selecting number of armature slots in a DC machine.

Unit - III

3. a) What is window space factor "kw" and stacking factor ks?

   b) What is the effect of variation of frequency on Hysteresis loss, Eddy current loss, Leakage reactance and Winding resistance?

   c) Why power transformers are designed to have maximum efficiency at or near full load where on distribution transformers are designed to have maximum efficiency at loads quite lower than full load?

   d) List the following with respect to a power transformer:

      i) Specifications

      ii) Design variations

      iii) Constraints

OR

Determine the main dimensions of the core for a 250 kVA, 6600/415V, 50Hz, 3ph. transformer with star/star connected winding. Also find the number of turns and the area of cross section of the windings. Assume approximate values of volts per turn = 9, maximum flux density = 1.25 Tesla, $A_i = 0.62\ d^2$, window space factor $k_w = 0.27$, Height of window = 2 × width of window. Current density = 2.5A/mm^2, width of laminations = 0.92d where $E_t = 4.44\ Bm\ A_i\ f$ and $L = 2w$.

Unit - IV

4. a) Explain the necessity of damper windings in synchronous machine.

   b) Explain "Critical speed" and "Run-away speed" with respect to synchronous machine.

   c) Give the reasons for the presence of harmonics in the output voltage waveform of a synchronous machine and means adopted to reduce them.

   d) Discuss the factors which influence the selection of specific magnetic and electric loadings in the design of synchronous machine.

OR

Find the main dimensions of a 100MVA, 11kV, 50Hz, 40 poles salient pole generator assuming air gap flux density as 0.65 wb/m^2 and ampere conductors as 40,000 per meter. The peripheral speed should not exceed 60 m/s.