Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY

Summer Examination-2018

Subject Name: Electrical Machine Design-I

Subject Code: 4TE07EMD1 **Branch: B.Tech (**Electrical)

Semester:7 **Date:**22/03/2018 **Time:**10:30 To 1:30 **Marks:** 70

Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 **Attempt the following questions:** **(14)**

a) Define the term Specific electric loading. **(1)**
b) What are categories of transformer used in power system? **(1)**
c) What do you meant by cross fluxing in transformer? **(1)**
d) Write different types of winding used for transformer. **(1)**
e) What is CTC winding? **(1)**
f) Which type of material is used for core lamination in transformer? **(1)**
g) Define the term Magnetic electric loading. **(1)**
h) What is role of commutator in d.c machine? **(1)**
i) Which factor is important for choice of ampere conductor in d.c. machine? **(1)**
j) List advantages of no. of higher pole in d.c machine **(1)**
k) What are effects of armature reaction? **(1)**
l) On what factors does the length of airgap in d.c machine depend ? **(1)**
m) What is window space factor ? **(1)**
n) What are different types of transformer? **(1)**

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

a) What are the factors that limit the design of an electrical machine? **(7)**
b) Explain how eddy current loss occurs. Derive an expression for eddy currentloss ina magnetic material. **(7)**

Q-3 **Attempt all questions** **(14)**

a) Derive output equation of 3 –Φ Transformer. Write significance of constant "k". **(7)**
b) A design is required for a 50 kw, 4 pole, 600 r.p.m. d.c. shunt generator, the full load terminal voltage being 220 V. If the maximum gap density is 0.83 Wb/m^2 and the armature ampere conductors per meter are 30,000, calculate suitable dimensions of armature core to give a square pole face. **(7)**

Assume that the full load armature voltage drop is 3 percent of the rated terminal voltage, and the field current is 1 percent of rated full load current. Ratio of pole arc to pole pitch is 0.67.

Q-4 **Attempt all questions** **(14)**

a) Derive an expression for the design of core for Square and cruciform sectionsalso state the reason why circular coils are always preferred in comparison to rectangular coils. **(7)**

b) Determine the main dimensions of the core, the number of turns and the cross section of conductors for a 5 KVA, 11000/400 V, 50 Hz, single phase core type distribution transformer. The net conductor area in the window is 0.6 times the net cross-section of iron in the core.Assume a square cross section for core, a flux density 1 Wb/m^2, a current density 1.4 A/mm^2, and a window space factor 0.2.The height of window is 3 times its width. **(7)**

Q-5 **Attempt all questions** **(14)**

a) Deduce the expression of m.m.f for the air gap of the armature for the slotting and ducting. **(7)**

b) Derive the condition for the optimum design of transformer for the minimum cost and minimum loss. **(7)**

Q-6 **Attempt all questions** **(14)**

a) Explain design difference between core & shell type transformers. **(7)**

b) What are the different methods of cooling of transformer? Explain. **(7)**

Q-7 **Attempt all questions** **(14)**

a) Derive output equation of 1 –Φ Transformer. **(7)**

b) Derive the output equation of d.c.machine. **(7)**

Q-8 **Attempt all questions** **(14)**

a) Explain the Choice of average gap density of DC machine. **(7)**

b) Explain the design procedure in the design of field windings for a d.c.shunt machine. **(7)**