CODE NO:- K-6
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E. (EEP/EE/EEE) Examination Nov/Dec 2015
Electrical Machine Design
(Revised)

[Time: Three Hours]   [Max. Marks: 80]

"Please check whether you have got the right question paper."
N.B i) Q.No.1 and Q.No.6 are compulsory.
     ii) Attempt any two questions from Q.No.2 to Q.No.5
     iii) Attempt any two questions from Q.No.7 to Q.No.10.
     iv) Assume suitable data wherever necessary.
     v) Figure to the right indicates full marks.
SECTION-A

Q1.   Attempt the following (any five)   10
    i) What are the considerations to be made while designing electrical machine.
    ii) Enlist the different design circuits of electrical machines.
    iii) What do you mean by rating of machine?
    iv) Define gap contraction factor for slot.
    v) List the some limitations in design.
    vi) Which winding in transformer placed near to the core? Why?
    vii) How heat dissipated in transformer.
    viii) Give two advantages of stepped core in transformer.

Q.2 A Deduce can expression for the mmf required for air of an armature with slots and ducts.   07
    B Determine the apparent flux density in the teeth of DC machine when the real flux density is 2.15wb/m^2,   08
     pitch 28mm, slot width 10mm & gross are length 0.35m. the number of ventilating ducts are 4 each 10mm
     wide. The magnetization force for a flux density of 2.15 wb/m^2 is 55000A/m. the stacking factor is 0.9

Q.3 A   1.   For a transformer show that emf per turn E_t is given as   07
      $E_t = K\sqrt{Q}$
    B Determine the dimensions of core and yoke for 100KVA, 50Hz, single phase core type transformer. A square   08
     core is used with distance between adjacent limb equals to 1.6 time the width of largest stamping. Assume
     voltage per turn of 14 volts, max flux density 1.1wb/m^2, window space factor 0.32 and current density
     3A/mm^2.
     Take stacking factor 0.9.

Q.4 A State the methods of cooling used for dry and oil immersed type of transformer.   07
    B The tank of 575KVA, transformer has dimensions, length, width and height are 105cm, 65cm and 150cm   08
     respectively. The full load losses 6.6kw. Find a suitable arrangement cooling tube, diameter of cooling tube
     5cm, length of each tube is 127.5cm. The tubes are spaced 75cm. improvement of convection due to
     provision of cooling tube is 35%, on lan temp rise of wall 35^{0}C watts/m^2/oc due to convection =6.5
     Watts /m^2/oc due to radiation =6

Q.5   Attempt <u>any three.</u>   15
    i) Different aproches of electrical machine design.
    ii) Window space factor
    iii) Heating and cooling cycle in transformer winding
    v) Carters coefficient & its significance.

SECTION-B

Q.6   Attempt the following (any five)   10
    i) What are the main dimensions of an Induction motor?
    ii) What are the factors to be considered for choice of specific magnetic loading in induction motor?
    iii) Which part of induction motor having maximum flux density? What is its value?
    iv) Why rotor slots of squirrel cage induction motor are skewed.
    v) Enlist the different type of stator winding in induction motor.
    vi) What happen if air gap length of induction motor is doubled?
    vii) What type of slots are preferred for induction motor? Why.
    viii) Write the formula for air gap length in three phase induction motor in terms of length and diameter.

Q.7 A Discuss the factors affecting length of air gap in three phase induction motor.   07
    B A 415volts, 3-phase, 50Hz, 6pole delta connected induction motor has specific magnetic loading of $0.5wb/m^2$ 08
    and specific electric loading of 24000A/m. The stator are diameter and length are 0.75m and 0.15m
    respectively. Find the output of machine it the full load efficiency and power factor are 0.88 and 0.89
    respectively. Determine also the number of stator slots.

Q.8 A Discuss the factors that guided a designer to select the number of slots for the stator of induction motor.   07
    B Find the main dimension, no of stator turns and stator slots of 5HP, 3phase 50Hz, 1470rpm, squirrel cage   08
    delta connected motor.
    Use the following data
    Bav $=0.46wb/m^2$.
    Ac=22000 A/m
    η=83%
    Pf 0.84 lassing

Q.9 A Discuss the factors deter mining the choice of rotor slots in induction motor.   07
    B Find the current in the rotor bar and end ring of cage rotor of 6 poles, 3phase induction motor having 72   08
    stator slots with 15 conductors in each slot. The stator   current per phase is20A.& rotor slots are 55.

Q.10   Attempt the following (any three)   15
    i) Design of choKe coil.
    ii) Cogging and crowling in induction motor.
    iii) Output equation of induction motor.
    iv) Calculation of ampere turns for iron path in electrical machine
    v) Unbalanced magnetic pulse and its estimation in induction motor.