

SUBJECT CODE NO:- E-9
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(EEP/EE/EEE) Examination Nov/Dec 2017
Electrical Machine Design
(REVISED)

[Time: Three Hours]

[Max.Marks:80]

- N.B
- Please check whether you have got the right question paper.
- i. Q.1 and Q.6 are compulsory
 - ii. Attempt any two questions from Q.2 to Q.5
 - iii. Attempt any two questions from Q.6 to Q.10
 - iv. Assume suitable data wherever necessary

Section A

- Q.1 Attempt any five 10
- i) What do you mean by design & electrical machines
 - ii) Enlist the different design circuits
 - iii) Define specific magnetic loading & specific electric loading
 - iv) State the advantages of semi open slots used in Induction motor.
 - v) What is the significance of carters coefficient
 - vi) Why rotor conductors of sq. cage rotor are not provided with insulation
 - vii) What do you mean by magnetic leakage in fringing in rotating machine
 - viii) What do you mean by rating of rotating machine?
- Q.2 a) Define the expression for gap contraction factor for slot and gap contraction factor for ventilating ducts 07
- b) Determine the mmf required for the air gap of d. c. machines having open slots 08
- Given the following particulars
- Slot pitch=4.3cm
- Slot opening=2.1cm
- Gross core length=48cm
- Pole arc=18cm
- Air gap length=0.6cm
- Flux/pole=0.056 weber
- There are 8 ventilating ducts each 1.2cm wide
- Carters coefficient for slot=0.41
- Carters coefficient for duct =0.28
- Q.3 a) Deduce the output equation of 3 phase induction motor in terms of its specific loading. Also indicate the significance of terms involved 07
- b) In the design of 30 H.P, 440v, 960rpm 50Hz, delta connected induction motor assume the specific electric loading. 25000 ac/m, specific magnetic loading of 0.46 wb/m² full load efficiency 86%, power factor 0.87.estimate the main dimensions of stator 08
- Q.4 a) Explain the various factors to be considered for proper choice of rotor slots of induction motor 07
- b) Find the current in the bar and end ring of a case rotor of 6-pole, 3-ph, induction motor having 72 stator slots with 15 conductors in each slot. If the stator current is 20A. and rotor slots are 55. Find the suitable size of cage bar and end ring. 08

- Q.5 Attempt any three 15
- Modern trend in electrical machine design
 - Standardization and specifications in rotating machine
 - Selection of air gap length in rotating machine
 - Estimation of leakage reactance in induction motor
 - Choice of specific loadings in Induction motor

Section B

- Q.6 Attempt any five 10
- What are the different modes of heat dissipation in electrical machines
 - Define heating and cooling time constant
 - Define heating and cooling cycle of transformer
 - What are the causes of temperature rise in transformer
 - Enlist the type of windings used in transformer
 - What is the function of yoke in transformer
 - What do you mean by stacking factor
 - What type of mechanical force developed in transformer winding

- Q.7 07
- Derive the output equation of 3-phase transformer 08
 - A 3-phase 50Hz, oil cooled core type transformer has the following dimensions
 - Distance between core centers=0.2 m
 - Height of window=0.24 m
 - Diameter of circumscribing circle=0.14m
 - Flux density in the core=1.25 wb/m²
 - Current density in the conductor=2.5A/mm²
 Estimate the KVA rating of transformer
 Assume window space factor 0.2 and a core area factor 0.56 and the core is 2-stepped.

- Q.8 07
- Explain in detail the design of square and stepped core of transformer 08
 - Determine dimensions of core yoke for 100KVA, 50Hz, single phase core type transformer. A square core is used with distance between adjacent limbs equal to 1.6 times the width of lamination. Assume voltage per turn of 14 volts. Maximum flux density 1.1 wb/m², window space factor 0.32 and current density 3 A/mm². Take spacing factor 0.9

- Q.9 07
- How are the mechanical forces developed on transformer winding? How the different forces are estimated? 08
 - Derive the expression for the calculation of no cooling tubes provided on transformer tank. 08

- Q.10 Attempt any three 15
- Obtain the expression for leakage reactance of 3-phase core type transformer
 - State the cooling methods used for dry & oil immersed type of transformer
 - Explain the design steps of choke coil.
 - Explain with suitable diagram the function of conservator and breather in 3-phase transformer
 - Estimation of no load current in 3-phase transformer