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Question Paper Code : 42508

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Sixth Semester
Electrical and Electronics Engineering
EE 2355 – DESIGN OF ELECTRICAL MACHINES
(Regulations 2008)
(Common to PTEE 2355 – Design of Electrical Machines for B.E. (Part-Time) Fifth Semester – EEE – Regulations 2009)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. What are the major considerations in electrical machine design ?
2. What are the factors that affect the size of Rotating machines ?
3. What are the factors to be considered in the design of commutator of a DC machine ?
4. Mention any two guiding factors for the choice of poles.
5. Why is transformer yoke designed for low flux density ?
6. What are the methods of cooling of transformer ?
7. List the advantages of using open slots.
8. Why fractional slot winding is not used for induction motor ?
9. What are the factors that influence the choice of specific magnetic loading in a synchronous machine ?
10. Define Short Circuit Ratio of a synchronous machine.

PART – B **(5×16=80 Marks)**

11. a) What are the main group of electrical conducting materials ? Describe the properties and application of this material. **(16)**

(OR)

b) Describe the methods of measurements of temperature rise in various parts of an electrical Machine. **(16)**

12. a) i) Derive the output equation of DC machine. **(8)**

ii) A 5KW, 250V, 4Pole, 1500 rpm DC shunt generator is designed to have a square pole face. The specific magnetic loading and specific electric loading are 0.42wb/m^2 and 15000 ac/m respectively. Find the main dimensions of the machines. Assume full load efficiency 87% and poles arc to pole pitch ratio is 0.66. **(8)**

(OR)

b) Calculate the MMF required for the air gap of a salient pole synchronous machines having core length of 0.2 m including 4 ducts of 10 mm each; polearc=0.19m. SlotPitch=65.4mm; slotopening=5mm. Airgaplength=5mm. Flux per pole = 52m Wb; Carter's Coefficient is 0.18 for opening/gap = 1; Carter's coefficient is 0.28 for opening/gap = 2. **(16)**

13. a) Explain the different methods of cooling of Transformers. **(16)**

(OR)

b) A single phase, 400V, 50Hz, transformer is built from stampings having a relative Permeability of 1000. The length of the flux path is 2.5 m, the area of cross section of the core is $2.5\times10^{-3}m^2$ and the primary winding has 800 Turns. Estimate the maximum flux and no load current of the transformer. The iron loss at the working flux density is 2.6W/kg. Iron weight 7.8×10^3 kg/m^3, stacking factor is 0.9. **(16)**

14. a) State and explain the factors to be considered when estimating the length of air gap of a 3-Phase induction motor. **(16)**

(OR)

b) A 15KW, 440V, 50Hz, 3 phase induction motor is built with a stator bore 0.25 m and a Core Length of 0.16. The specific electric loading is 23000 ampere conductors per meter. Using the data of this machine, determine the core dimensions', number of stator slots and number of stator conductors for a 11KW, 460V, 6 Pole, 50 Hz motor. Assume: a full load efficiency of 84% and power factor of 0.82 for each machine. The winding facto is 0.955. **(16)**

15. a) Find the main dimensions of 100MVA, 11KV, 50Hz, 150rpm, 3 phase water wheel generator. The average gap density is 0.6Wb/m^2 and the ampere conductors per meter are 40,000. The Peripheral speed should not exceed 65 m/s at normal running speed in order to limit the Run-away peripheral speed. **(16)**

(OR)

b) Determine the output coefficient for a 1500KVA, 2200Volts, 3 phase, 10pole, 50Hz, star connected alternator with sinusoidal flux distribution. The winding has 60° phase spread and full pitchcoils.ac = 30000amps.conductor/m, B_{av} = 0.6Wb/m^2. If the peripheral speed of the rotor must not exceed 100 m/sec and the ratio of pole pitch to core length is to be between 0.6 and 1. Find D and L. Assume an air-gap length of 6 mm. Find also the approximate number of stator conductors. **(16)**