Code No: R32021 **R10** **Set No: 1**

III B.Tech. II Semester Supplementary Examinations, January-2014

ELECTRICAL MACHINE DESIGN

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Describe magnetic circuit of an electric machine. [7M]
   (b) What are the different modes of heat dissipation in Electric machine? [8M]

2. Develop a Winding diagram for a 4 Pole, 24 Slot, 3 Phase mesh connected Armature. [15]

3. (a) Explain the brief constructional detail of DC machine. [8M]
   (b) Explain how the interpoles in a DC machine are designed. [7M]

4. (a) Explain the term Cross-fluxing in transforms. [5M]
   (b) Give the procedure to design the coil of a shell type transforms. [10M]

5. Estimate the main dimension including winding conductor area of a 3 Phase Delta/star Core type transforms rated at 300 KVA, 6600/440V 50Hz. A suitable core with three steps having a Circumscribing circle of 0.25m diameter and a leg spacing of 0.4m in available. The emf per turn in 8.5 V. Assume a current density of 2.5 A/mm^2,a winding space factor of 0.28 and a stacking facts of 0.9. [15M]

6. (a) Explain the function of frames in a Induction motor. [6M]
   (b) Derive the output equation of a three phase induction motor. [9M]

7. Find the values of diameter and length of stator core of a 7.5 KW 220V,50 Hz, 4 Pole, 3 Phase Induction motor for best power factor. Given that specific magnetic loading=0.4 wb/m^2: specific Electric loading = 22000A/m: Efficiency = 0.86: power factor=0.87. [15M]

8. (a) What are the types of prime movers used for synchronous generation? [7M]
   (b) What are the advantages of Circular poles in synchronous machines? [8M]

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Code No: R32021 **R10** **Set No: 2**

III B.Tech. II Semester Supplementary Examinations, January-2014

ELECTRICAL MACHINE DESIGN

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Describe Electric Circuit of an Electric machine. [7M]
   (b) What is artificial convection? What is its use in Electric machine? [8M]

2. A 4 Pole single layer wave would armature has 25 slots and 25 coils. The commutator has 25 segments. Work out its winding details. [15]

3. (a) What is the need of interpole winding in a DC machine. [6M]
   (b) Explain the procedural to design commutator of a DC machine. [9M]

4. (a) What types of mechanical forces are developed in a transforms. [7M]
   (b) Explain the procedure steps to design the coil of Transform. [8M]

5. Calculate the dimension of the core, the number of turns and cross section of the conductor for a 100 KVA, 2300/400V, 50Hz 1-phase transform shell type, assume ration of magnetic and electric loading $480x10^8$.Maximum flux density 1.1 wb/wt^2 .current density 2.2 $x10^6 A/m^2$. Window space factor 0.3, make other suitable assumption. [15M]

6. (a) Explain the factor that effect the over load capacity in I.M. [7M]
   (b) Give the procedure to design the area of slots and the configuration of slots. [8M]

7. Determine the diameter of stator box and core length of 70hp,415V,3-phase, 50Hz star connected 6 Pole induction motor for which the specific electric and magnetic loading are 32000 A/m and 0.51 wb/m^2 respectively . Take the efficiency as 90%: power factor as 0.91.Assume pole pitch equal to core length. [15]

8. Obtain the main dimension of the rotor of a 50 MVA, 2 pole,50 Hz Synchronous generator. The peripheral speed is limited to approximate 160 m/sec. Take an electric loading of 65000 A/m and a mean gap density of 0.575 wb/m^2. Assume a gap length of 25mm. [15]

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Code No: R32021 **R10** **Set No: 3**

III B.Tech. II Semester Supplementary Examinations, January-2014

ELECTRICAL MACHINE DESIGN

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Describe thermal Circuit of an Electric machine. [7M]
   (b) What is the effect of fringing of flux in electrical machine. [8M]

2. Give winding details and layout of 30 slot, 4 pole, 3 phase wave would rotor of an induction rotor. [15]

3. (a) What are the various types of slots in a DC machine. [6M]
   (b) Give the Design procedure for main poles in a DC machine. [9M]

4. (a) Explain the significance of "window space factor" in the design of transformers. [7M]
   (b) Narrate the design of cooling tubes of a transforms. [8M]

5. Determine the dimensions of coil and yoke of a 5KVA,50 Hz simple phase core type transform. A rectangular core is used with long side twice as long as short side. The window height is 3 times the width. Voltage per turn is 1.8 V. Space factor 0.2; current density 1.8 A/mm^2 flux density 1 wb/m^2. [15M]

6. (a) How do you calculate the area of end rings. [7M]
   (b) How the change in frequency effect the various dimensions of an Induction rotor. [8M]

7. Calculate the magnetizing current of a 415V,4 Pole 3 Phase, 50Hz Induction rotor having the following data: stator slots 36; conductors per slot =30: stator bore=0.13m; stator core length=0.13m; effective air gap=1mm.The winding is full pitch and the phase speed is 60^0.Assume that iron has infinite permeability. [15]

8. Explain the procedure to design the salient pole field coil for synchronous machines. [15]

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Code No: R32021 **R10** **Set No: 4**

III B.Tech. II Semester Supplementary Examinations, January-2014
ELECTRICAL MACHINE DESIGN
(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) What are limitations to be considered in the design of an Electric machine? [8M]
   (b) Explain the terms stacking factor, Carter's coefficient. [7M]

2. Determine the pole phase group sequence and distribution of slots for a 3 phase, 48 slots, 10 pole winding. [15]

3. (a) List the factors that effect the number of poles in DC machines. [7M]
   (b) Explain the factors that effect the design of main dimensions of a DC machine.[8M]

4. (a) What are the cooling schemes available for cooling of transforms? Discuss. [8M]
   (b) Explain the constructional details of a 3-phase transformer. [7M].

5. Calculate the core and window areas required to 1000KVA, 6600/400V, 50Hz, Single phase core type transforms. Assume a maximum flux density of 1.25 wb/mt^2 and a current density of 2.5A /mm^2 . Voltage per turn is 30V, Window space factor 0.32. [15M]

6. (a) Explain the effect of dispersion Coefficient on the power factor of Induction motor. [7M].
   (b) Give the procedure to design the stator teeth and length of mean turn of an Induction motor. [8M]

7. Determine the approximate diameter and depth of stator core, The number of stator slots and the number of conductors for a 11 KW,400V,3 Phase 4 Pole,1425 rpm delta connected induction motor. Specific magnetic loading in 0.45 wb/m^2 and specific Electric loading 23000 A/M. Assume full load efficiency and Power factor as 0.85 and 0.88 respectively. Assume ratio of core length to pole pitch is 1.0, The stator employs a double layer winding. [15]

8. (a) Derive the output equation of an alternator. [7M]
   (b) Give the procedure to design main dimensions of a synchronous machine. [8M]

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