Q. Code: 807155

Reg. No. | | | | | | | | | | | | | |

B.E / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Sixth Semester

EE18003 - DESIGN OF ELECTRICAL APPARATUS

(Electrical and Electronics Engineering)

(Regulation 2018 / 2018A)

TIME:3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Design dc machines for the given set of specification.	**4**
CO 2	Design transformers for the given set of specifications.	**4**
CO 3	Design Induction motors for the given set of specifications.	**4**
CO 4	Design synchronous machines for the given set of specifications.	**4**

PART- A(10x2=20Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Define specific Electric loading.	**1**	**2**
2.	State the properties which determine the suitability of a material for insulting materials.	**1**	**1**
3.	Explain field form factor.	**1**	**2**
4.	What are the losses in a DC machine?	**1**	**1**
5.	Why is the core of a transformer laminated ?	**2**	**2**
6.	Top and bottom surfaces of the transformer tank are not considered for the design of cooling tubes for transformer. Why?	**2**	**2**
7.	What are the factors to be considered for the choice of ampere conductors per metre in induction motor?	**3**	**2**
8.	State any two rules for selecting rotor slots of squirrel cage machines.	**3**	**1**
9.	Mention the advantages of single layer winding in synchronous motor.	**4**	**1**
10.	What is the use of damper winding in synchronous motor?	**4**	**2**

PART- B (5x 14=70Marks)

		Marks	CO	RBT LEVEL
11. (a)	The stator of a machine has a smooth surface but its rotor has open type of slots with slot width W_s=Tooth width (Wt), W_t=14 mm and length of air gap l_g=3 mm.Find the effective length of air gap if the carter's coefficient = [$1/(1+5(l_g/W_s)]$.There are no radial ducts	**(14)**	**1**	**4**
	(OR)			
(b)	What are the limitations in the design of electrical apparatus? Explain them.	**(14)**	**1**	**2**
12. (a)	A design is required for a 100 KW, 4 poles, 600 rpm DC 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 metre are 30,000. Calculate suitable dimensions of armature core to give a square pole face. Assume that the full load armature voltage drop is 3% of the rated terminal voltage and that the field current is 1% of rated full load current. Ratio of pole arc to pole pitch is 0.67.	**(14)**	**1**	**4**
	(OR)			
(b)	Explain the effects of choice of poles in a DC machine on (1) Frequency of flux reversal (2) Weight of iron (3) Weight of copper (4) Length of commutator.	**(14)**	**1**	**3**
13. (a)	**(i)** Calculate the kVA output of a single phase transformer from following data:	**(14)**	**2**	**4**

Core height / Distance between core centres = 2.8 m

Diameter of circumscribining circle / Distance between core centres = 0.56 m

Net iron area / Area of Circumscribing circle = 0.7 m^2

Current density = 2.3 A/mm^2, window space factor = 0.27,

frequency = 50Hz.Flux density of core = 1.2 wb/m^2, distance between

core centres= 0.4m.

(OR)

(b)	State different methods of cooling the transformers and explain each method with relevant diagrams. State merits and limitations of each method.	**(14)**	**2**	**3**

14. (a)	Derive the output equation of induction machine in terms of its main dimensions.	**(14)**	**3**	**3**

(OR)

(b)	Find the main dimensions of a 15kW,3ϕ 400 V, 50 Hz, 2810 rpm squirrel cage induction motor having an efficiency of 88% and full load power factor of 0.9. Specific magnetic loading is 0.5 wb/m^2 and specific electric loading =25000 A/m. Take rotor peripheral speed as approximately 20m/sec at synchronous speed.	**(14)**	**3**	**4**

15. (a)	Discuss the factors affecting the choice of specific electric loading and magnetic loading in an alternator.	**(14)**	**4**	**3**

(OR)

(b)	Compute the main dimensions of a 1000 kVA, 50 Hz, 3ϕ; 375 rpm alternator. The average air gap density is 0.55 wb/m^2 and the ampere conductors per metre are 28000.Use rectangular poles. Assume the ratio of core length to pole pitch equal to 2. Maximum permissible peripheral speed is 50 m/sec. The runaway speed is 1.8 times the synchoronous speed.	**(14)**	**4**	**4**

PART- C (1x 10=10Marks)

(Q.No.16 is compulsory)

		Marks	**CO**	**RBT LEVEL**
16.	Derive the output equation of a DC generator and point out salient features of this equation.	**(10)**	**1**	**3**

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