Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: EE409

Course Name: Electrical Machine Design

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks. Marks

1		What is meant by hot spot rating in electrical machines?	(5)
2		Compare the reluctance of slotted armature with that of smooth armature surface.	(5)
3		Derive the output equation of DC machine.	(5)
4		Explain different types of cooling systems used in synchronous machines.	(5)
5		List out and explain the factors to be considered for selection of specific electric loading in 3-phase induction motors.	(5)
6		State the main constructional differences between cage induction motor and slip ring induction motor.	(5)
7		Explain synthesis method for computer aided design of electrical machines	(5)
8		Explain on few softwares used for designing electrical machines?	(5)

PART B

Answer any two full questions, each carries 10 marks.

9	a)	Examine any four components of armature leakage flux.	(4)
	b)	Derive the relation between real and apparent flux densities.	(6)
10	a)	Derive the output equation for 3 phase core type transformer.	(4)
	b)	Determine the dimensions of core and yoke for a 200KVA 50Hz single phase core type transformer. A cruciform core is used with distance between adjacent limbs equal to 1.6 times width of core laminations. Assume voltage per turn 14 V, maximum flux density 1.1Wb/m^2, window space factor 0.32, current density 3A/mm^2 and stacking factor 0.9. The net iron area is 0.56d^2 in a cruciform core where d is the diameter of circumscribing circle and width of largest stamping is 0.85d.	(6)
11	a)	Explain unbalanced magnetic pull in rotating electrical machines.	(5)
	b)	Derive the ratio of gross core area to area of circumscribing circle for a square core of a transformer.	(5)

PART C

Answer any two full questions, each carries 10 marks.

12 a) Explain the flux pulsation produced in dc machine. (5)

b) Explain step by step design procedure of brushes and commutator in a DC machine. (5)

13 Find the main dimensions of a 100 MVA, 11kV, 50 Hz, 150 rpm,3 phase water wheel generator. The average gap density is 0.65 Wb/m^2 and the ampere conductors per meter is 40000.The peripheral speed should not exceed 65m/s at normal running speed in order to limit the run away peripheral speed. Assume the winding factor to be 0.955. (10)

14 a) Explain step by step design procedure for armature of a dc machine. (5)

b) Find the main dimensions of a 2500 kVA, 187.5 rpm, 50 Hz, 3 phase, 3 kV, salient pole synchronous generator. The generator is to be vertical, water wheel type. The specific electric loading is 34000 A/m and B_{av} is 0.6 Wb/m^2. Use circular poles with ratio of core length to pole pitch to be 0.65. Specify the type of pole construction used if the run-away speed is about 2 times the normal speed. (5)

PART D

Answer any two full questions, each carries 10 marks.

15 a) How do the iron losses affect selection of B_{av}? (5)

b) Explain cogging and crawling in 3-phase induction machines. (5)

16 a) Explain on Analysis method of solving electrical machine using CAD with a flow chart. (6)

b) What are the advantages of analysis method? (4)

17 a) Design the main dimensions of a 25 kW, 3 phase, 415V, 50 Hz, 1475 rpm squirrel cage induction motor having an efficiency of 85 % and full load power factor of 0.86. Assume Bav= 0.5T, ac = 28000A/m. The rotor peripheral velocity is 25 m/s at synchronous speed. (5)

b) Explain the steps involved in the computer aided design and analysis of electrical machines. (5)

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