510605

B. Tech. V - Sem. (Main/Back) Exam., (Academic Session 2021- 2022)
Electrical Engineering
5EE4 – 05 Electrical Machine Design

Time: 3 Hours

Maximum Marks: 120
Min. Passing Marks:

Instructions to Candidates:

Part – A: Short answer questions (up to 25 words) 10 × 2 marks = 20 marks. All ten questions are compulsory.

Part – B: Analytical/Problem solving questions 5 × 8 marks = 40 marks. Candidates have to answer five questions out of seven.

Part – C: Descriptive/Analytical/Problem Solving questions 4 × 15 marks = 60 marks. Candidates have to answer four questions out of five.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL   2. NIL

PART – A

Q.1 Write the main cause of temperature rise in electrical machine.	[2]
Q.2 What do you understand by rating of machines?	[2]
Q.3 Define short circuit ratio.	[2]
Q.4 What is meant by synthesis and hybrid method?	[2]
Q.5 Explain about the transformer regulation.	[2]
Q.6 Define leakage reactance in poly phase machine.	[2]

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Q.7 What methods are used for cooling of transformers? [2]

Q.8 Explain specific electric and magnetic loading. [2]

Q.9 Why do we need for bracing the end connections of turbo alternators? [2]

Q.10 Give the comparison of core type and shell type transformers. [2]

PART – B

Q.1 Write the output equations of single and three phase transformers and explain different parameter. [8]

Q.2 Estimate the main core dimensions of 250KVA, 3-ϕ, 6600/440V delta/star. 50Hz, core type transformer with following details -

Stepped core for which area factor = 0.56

Space factor for window = 0.25

Voltage per turn = 21.0V

Current density = 2.36 A/mm²

Flux density = 1.1 Tesla [8]

Q.3 Explain in detail about the design factors of electrical machines. [8]

Q.4 Explain the difference between PMSM and BLDC machines. [8]

Q.5 Explain in detail about different factor that should be considered while designing the rotor slots of squirrel cage motor. [8]

Q.6 Calculate the following design information for 30KW, 440V, 3-phase, 6 pole, 50Hz delta. Connected squirrel cage induction motor -

(i) Main dimension of stator frame

(ii) No. of turns per phase in stator winding

(iii) Number of stator turns

Assume – specific magnetic loading = 0.48 tesla, full load efficiency = 0.88, winding factor = 0.95, specific electric loading = 26000 ampere-conductor/m, full load power factor = 0.86. [8]

Q.7 Explain in detail about the core design of the transformers. [8]

PART – C

Q.1 Explain in detail about the major considerations to evolve a good design of electrical machines. [15]

Q.2 Write the output equation of synchronous machines and explain in detail about different parameters. [15]

Q.3 Design a 3 phase water wheel alternator with following specification.

Rating of machine = 38MVA

Voltage = 11 KV

No. of poles = 12

Pole arc to pole pitch ratio = 0.67

Frequency = 60 Hz air gap sinusoidal type. [15]

Q.4 Why we need CAD analysis for the motors? Explain in detail. [15]

Q.5 Explain in detail about the stator design of induction machine. [15]

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