Roll No…….. **Total No. of Printed Pages: 1**
Total No. of Questions: [11]

M. Tech. EE (Semester – 2nd)
ADVANCED ELECTRICAL MACHINES
Subject Code: MELE1206
Paper ID: [190513]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It carries 16 marks. It consists of 4 questions of 4 marks each.
2. Section B consist of 4 questions of 8 marks each. The student has to attempt any 3 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(4 marks each)**

Q1. Explain the concept of "Short Circuit Ratio" in the context of synchronous machines. What information does it provide about the machine's performance?

Q2. Briefly describe the transient analysis of synchronous machines. How does sudden reactive loading and unloading affect the machine's behavior?

Q3. Discuss the in-rush current phenomena in transformers. What are the disadvantages of in-rush currents, and how can they be suppressed?

Q4. What is the significance of harmonics in transformers? Describe the methods used to suppress harmonics and improve transformer performance.

Section – B **(8 marks each)**

Q5. Discuss the mathematical representation of basic synchronous machine parameters. Explain the relationships between voltage, flux linkage, and inductance in synchronous machines. Include the physical significance of these parameters.

Q6. Describe Park's transformation and its physical concept. Provide the equations of performance in the transformed reference frame. How does this transformation simplify the analysis of synchronous machines?

Q7. Explain the concept of "reactive loading and unloading" in transient analysis of synchronous machines. Also, discuss the factors that can lead to sudden reactive loading and unloading events and their impact on machine dynamics.

Q8. Describe the balanced steady-state analysis of synchronous machines. Also, discuss phasor equations, phasor diagrams, and power-angle characteristics for both cylindrical rotor and salient pole machines.

Section – C **(10 marks each)**

Q9. Explain in detail the excitation phenomena in transformers and its effects on transformer performance. Also, describe the presence of harmonics in single-phase and three-phase transformers and discuss the disadvantages of harmonics.

Q10. Analyze the unbalanced operation of three-phase transformers. Additionally, explain the implications of a single-phase load on three-phase transformers and the effects of single-phasing. Discuss the use of tertiary windings to address these issues.

Q11. Provide a comprehensive overview of the transient torque in synchronous machines. Describe the qualitative and analytical approaches to transient analysis, including reactance and time-constants. Explain how to measure reactance and discuss the transient power-angle characteristics.