

**NATIONAL INSTITUTE OF TECHNOLOGY, DELHI**

**Name of Examination: Mid Semester March-2023**

**Branch: Electrical & Electronics Engineering**

**Semester: IV**

**Title of Course: Electrical Machines-I**

**Course Code: EEB 251**

**Time: 1.5 Hrs**

**Maximum Marks: 25**

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**Note: Attempt all questions. Assume and missing data.**

- Q1. All questions are compulsory and must be solved together at same place:
- Explain voltage regulation in a single-phase transformer and derive the condition for zero voltage regulation. (2 marks)
  - Compare two-winding transformer with same rating auto-transformer. (2 marks)
  - Explain the procedure to separate hysteresis and eddy current losses in a transformer. (2 marks)
- Q2. Explain the working of a practical two-winding transformer supplying leading power factor load with neatly drawn phasor diagram. (4 marks)
- Q3. Develop the mathematical equivalent circuit of an auto-transformer and draw phasor diagram for the operation. (5 marks)
- Q4. A transformer working at unity power factor has an efficiency of 90% both at full load and half load. The full load output is 0.5 kW. Determine the efficiency at (i) 75% of full load and 25% of full load. (5 marks)
- Q5. Calculate the all-day efficiency of a 100-kVA transformer for whom the maximum efficiency occurs at 40% of rated load. The transformer has core loss of 200 W. Its loading pattern for the whole day is as follows: (5 marks)
- Full-load at 0.8 pf (lag) for 4 hours
  - $\frac{3}{4}$ <sup>th</sup> of full load at 0.9 pf (lag) for 6 hours
  - 50 kW at 0.85 pf (lag) for 4 hours
  - $\frac{1}{4}$  of full load at 0.6 pf (lag) for 4 hours
  - No load for 6 hours

\*\*\*\*\*Best Wishes\*\*\*\*\*