

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER-III (NEW) EXAMINATION – WINTER 2024****Subject Code:3132407****Date:10-12-2024****Subject Name: Electrical Machines and Applications****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Explain the significance of interpole and compensating windings in DC Machine. **03**  
 (b) Derive emf equation of 1- $\phi$  transformer. **04**  
 (c) Explain the theory of production of rotating magnetic field with 3- $\phi$  supply in induction motor. **07**
- Q.2** (a) Explain open-circuit test of 1- $\phi$  transformer. **03**  
 (b) List the conditions for parallel operation of 3- $\phi$  transformers. **04**  
 (c) Explain Scott connection of transformers with necessary diagrams. **07**
- OR**
- (c) Explain auto-transformer. Derive the equation for the saving in copper. List the applications of auto-transformer. **07**
- Q.3** (a) Explain about the power stages in induction motor. **03**  
 (b) Derive the condition for maximum torque under running condition for induction motor. Also, derive the equation for maximum torque. **04**  
 (c) Explain double field revolving theory of 1- $\phi$  induction motor. **07**
- OR**
- Q.3** (a) Define slip. Derive the equation of speed of rotor field in space. **03**  
 (b) Explain auto-transformer starter for 3- $\phi$  induction motor. **04**  
 (c) Draw and explain the equivalent circuit for 1-  $\phi$  induction motor. **07**
- Q.4** (a) Compare Lap Winding and Wave Winding. **03**  
 (b) Derive the equation of armature torque for DC motor. **04**  
 (c) Explain the necessity of starter in DC Motor. Discuss four-point starter with necessary diagram. **07**
- OR**
- Q.4** (a) Explain power flow diagram of DC Motor. **03**  
 (b) Derive the EMF equation of DC generator for lap winding. **04**  
 (c) Describe the theory of armature reaction in DC generator with necessary diagram. **07**
- Q.5** (a) Define Distribution factor, Coil-span factor and voltage regulation. **03**  
 (b) Explain the working of AC servomotor with necessary diagram. **04**  
 (c) Explain the effect of increased load on synchronous motor with constant excitation with the help of vector diagram. **07**
- OR**
- Q.5** (a) Define pole pitch, coil pitch and commutator pitch. **03**  
 (b) Explain the working of DC servomotor with necessary diagram. **04**  
 (c) Explain MMF method for finding voltage regulation of an alternator. **07**

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