Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 51009

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Third Semester

Electrical and Electronics Engineering

EE 3303 — ELECTRICAL MACHINES – I

(Regulations 2021)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the principle of conservation of energy.

2. Define doubly excited magnetic field system.

3. Define the term critical field resistance in DC shunt generator.

4. Write the emf equation of a DC generator.

5. Outline the need of starter in dc motor.

6. Why should a dc series motor not be started on no load?

7. Justify that under short circuit test the core loss is negligible.

8. Define the turns ratio of the transformer.

9. State the merits and demerits of an auto transformer over two winding transformer.

10. List out the advantages of Scott connection of three phase transformers.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the multiply excited system of electromechanical energy conversion system.

Or

(b) Derive the expression for the field energy and co-energy of single excited magnetic system.

12. (a) An 8 pole lap connected armature has 960 conductors, a flux of 40 mWb per pole and a speed of 400 rpm. Calculate the emf generated. If the armature were wave connected generator at what speed must it be driven to generate 400 V.

Or

(b) Draw and explain the load characteristics of DC shunt and compound generator and state the reason for their different characteristics.

13. (a) A 200 V DC shunt motor has an armature resistance of 0.25 Ω and runs at 1100 rpm, Drawing an armature current of 40A. It is required to reduce the speed to 750 rpm. If the armature current remain same, find the additional resistance to be added in series with the armature circuit.

Or

(b) What is Electrical braking and Explain the various types of braking in DC Motor with neat sketches.

14. (a) Explain the principle of operation of a transformer and also draw the vector diagram to represent a load in unity, leading and lagging power factor.

Or

(b) A 1 kVA, 1000/200 V, 50Hz, 1Φ transformer has the following results

OC test : 1000 V, 0.24 A and 90W on HV side

SC test : 50 Hz, 5A and 110 W on HV side

Draw the equivalent circuit of the transformer referred to LV side.

15. (a) Derive an expression for saving in copper material in auto transformer over a two winding transformer of equal rating.

Or

(b) Compare the features of various three phase transformer connections with the neat diagram.

PART C — (1 × 15 = 15 marks)

16. (a) Describe with the neat sketch, the back to back test to obtain the efficiency on single phase transformers.

Or

(b) In a long-shunt compound generator, the terminal voltage is 230 V when generator delivers 150 A. Determine

(i) Induced emf (5)

(ii) Total power generated (5)

(iii) Distribution of this power. (5)

Given that shunt field, series field and armature resistance are 92 Ω, 0.015 Ω and 0.032 Ω respectively.

2 51009