

B-033

31N0502 / 31N0602

Roll No.:

31N0502/31N0602

Total No. of Pages.: 04

B.Tech III Sem Main/Back Exam 2025-26

Electrical and Electronics Engineering and Electrial Engineering

(3EX4-02/3EE4-02) – Electrical Machines-I

- Common to EE, EX

Time : 3 Hours

Maximum Marks: 70

Min. Passing Marks:

Instructions to Candidates:

Part-A: Short answer questions (up to 25 words) 10x2 marks = 20 marks. All ten questions are compulsory.

Part- B: Analytical/Problem Solving questions 5x4 marks = 20 marks. Candidates have to answer 5 questions out of 7.

Part – C: Descriptive/Analytical/Problem Solving questions 3x10 marks = 30 marks. Candidates have to answer 3 questions out of 5.

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 materials is permitted during examination. (Mentioned in form No. 205)

1 _____

2 _____

P.T.O.

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Part-A

- Q.1. Define statistically and dynamically induced emf
- Q.2. Write the relationship between reluctance and magneto motive force
- Q.3. What is fringing in magnetic circuits
- Q.4. Why the air gap between the pole pieces and the armature is kept very small in Dc Machines?
- Q.5. Define critical resistance
- Q.6. What are the properties of an ideal transformer?
- Q.7. Define armature reaction
- Q.8. What is meant by reactance voltage?
- Q.9. What is condition of maximum efficiency of transformer
- Q.10. What are methods to improve commutation

PART-B

- Q.1. Explain the operation of a magnetic circuit when AC current is applied to the coil wound on iron core. Draw the B-H curve and obtain the expression for hysteresis.
- Q.2. Explain the open delta connection to carry out 3-phase operation with help of two transformers. State its disadvantages.
- Q.3. Draw and explain the phasor diagram of a transformer under leading, lagging and unity power factor. Phasor diagram should indicate primary and secondary parameters.

- Q.4. What is armature reaction? Describe the effects of armature reaction on the operation of Dc machines.
- Q.5. A dc shunt generator delivers 50 kW at 250 v when running at 400 rpm. The armature and field resistance are 0.02Ω and 50Ω respectively. calculate the speed of the machine when running as a shunt motor and taking 50 kW input at 250 v. allow 1 v per brush for contact drop.
- Q.6. The equivalent circuit impedance of a 20-kVA, 8000/240-V, 60-Hz transformer are to be determined. The open-circuit test and the short-circuit test were performed on the primary side of the transformer, and the following data were taken:

Open-circuit test
(on primary)

Short-circuit test
(on primary)

$$V_{oc} = 8000 \text{ V}$$

$$V_{sc} = 489 \text{ V}$$

$$I_{oc} = 0.214 \text{ A}$$

$$I_{sc} = 2.5 \text{ A}$$

$$P_{oc} = 400 \text{ W}$$

$$P_{sc} = 240 \text{ W}$$

- Q.7. Write technical notes on the following:

a. Magnetic saturation and leakage fluxes

b. The series field winding has low resistance while the shunt field winding has high resistance

P.T.O.

PART- C

Q.1. A 3-phase transformer is used to step down the voltage of 3-phase, 11KV feeder line per phase turn ratio is 12. for a primary line current of 20A; calculate the secondary line voltage, line current and output KVA for the following primary connections:

a) star-delta b) delta-star c) delta-delta d) star-star

Q.2. (a) Derive an expression for torque developed in a dc motor

(b) Draw and explain torque Vs current (or Load) characteristics of dc shunt and series motor.

Q.3. Explain with necessary diagrams how two 3-phase transformers can be used to convert a 3-phase supply to a 2-phase supply.

Q.4. (a) Draw a neat sketch a dc generator. State the function of each part. derive the equation of emf induced in dc generator.

(b) Explain the process of building up a Voltage in a dc generator and give the conditions to be satisfied for voltage build up. What is critical field resistance and its significance?

Q.5. List the different speed control methods of Dc shunt motor and explain the speed control of at following conditions

a) Speed below rated speed

b) Speed above rated speed
