

Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

[Total No. of Questions: 9]

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Uni. Roll No.

Program: B.Tech. (Batch 2018 onward)

Semester: 3rd

Name of Subject: Electrical Machines-1 (Transformer & DC machines)

Subject Code: PCEE-103

Paper ID: 16066

Scientific calculator is Allowed

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

- 1) Parts A and B are compulsory
- 2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
- 3) Any missing data may be assumed appropriately

Part – A

[Marks: 02 each]

Q1.

- a) State the basic principle of a transformer.
- b) Define voltage regulation.
- c) List the two types of speed control methods of DC shunt motor.
- d) Illustrate the function of interpoles in a DC machine.
- e) Explain the phenomenon of magnetic saturation.
- f) A 10 KVA, 500/250 V, 50 Hz, single phase transformer has a net cross-sectional area 90cm^2 and a maximum flux density of 1.2 T. Evaluate the number of turns on both primary and secondary.

Part – B

[Marks: 04 each]

- Q2. Express the phenomenon of armature reaction in a DC machine.
- Q3. Enumerate the difference between a power and distribution transformer in terms of flux density.
- Q4. Examine the Swinburn's test for DC motor.
- Q5. Compare three- and four-point DC motor starters.

- Q6. Summarize the necessary conditions for successful parallel operation of three-phase transformer.
- Q7. A 220/400 V, 10KVA, 50Hz, single phase transformer has a copper loss of 120 W at full load. If it has an efficiency of 98% at full load, unity power factor, determine the iron losses. Evaluate the efficiency of the transformer at half full load at 0.8 pf lagging.

Part – C

[Marks: 12 each]

- Q8. Describe the working principle and construction of an auto transformer. Derive the expression for saving of copper as compared to two winding transformer.

OR

Explain the process of commutation in the DC machine. What are the adverse effects of poor commutation and summarize the different methods by which it be improved?

- Q9. Develop the equivalent circuit of a single-phase transformer. Explain the various steps involved. Also draw the relevant phasor diagram and approximate equivalent circuit diagram.

OR

A 220 V shunt motor with an armature resistance of 0.5 ohm is excited to give a constant main field. At full load, the motor runs at 500 rpm and draws an armature current of 30A. If a resistance of 1.0 ohm is placed in the armature circuit, find the speed at

- i) full load torque
- ii) double full load torque
