



CBCS SCHEME

21EE34

Third Semester B.E. Degree Examination, June/July 2023 Transformer and Generators

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Draw the load phasor diagram of a 10 transformer supplying lagging, leading and unity PF (Power Factor). (08 Marks)
- b. With the help of a neat diagram and phasor diagram explain the operation of a 3 ϕ star delta transformer. (06 Marks)
- c. The equivalent of a 200/400V, step up transformer has the following parameters referred to LV side equivalent resistance = 0.15 Ω , equivalent reactance = 0.37 Ω , core loss component of resistance = 600 Ω , magnetizing reactance = 300 Ω . When the transformer is supplying load of 10A at a P.F of 0.8 calculate :
 - i) Primary current
 - ii) Secondary terminal voltage. (06 Marks)

OR

- 2 a. Explain with the help of connection and phasor diagram how Scott connections are used to obtain two phase from three phase supply. (06 Marks)
- b. What is all day efficiency of transformer? Explain its importance in distribution transformers. (04 Marks)
- c. A 5KVA, 500/250V, 50Hz single phase transformer gave the following readings :
OC test : 500V, 1A, 50W [LV side open]
SC test : 25V, 10A, 80W [LV side shorted]
Determine :
 - i) Efficiency on full load and 0.8pF lagging
 - ii) Voltage regulation on full load 0.8 pF leading
 - iii) Efficiency on 60% of full load and 0.8 pF leading
 - iv) Draw the equivalent circuit referred to primary and insert all values in it. (10 Marks)

Module-2

- 3 a. Why Parallel operation of 2 single phase transformers are needed and mention the necessary conditions to be satisfied for parallel operation. (06 Marks)
- b. Two 250KVA transformers supplying a network are connected in parallel on both primary and secondary sides. Their voltage ratios are same the resistance drops are 1.5% and 9% and reactance drops are 3.33% and 4% respectively. Calculate the KVA loading on each transformer and as power factor. When the total load on the transformers is 500KVA at 0.707 lagging power factor. (08 Marks)
- c. With a neat circuit diagram explain Sumpner's test condited on 2 identical transformers also show how efficiency and regulation are calculated form Sumpner's test data. (06 Marks)

OR

- 4 a. Obtain the expression for current shared by two transformers with unequal voltage ratios connected in parallel. The transformers have unequal impedances. Also draw the phaser diagram. (10 Marks)
- b. With a neat diagram show the current distribution in step up and step down auto transformer. Also derive the expression for saving of copper in an auto transformer. (10 Marks)

Module-3

- 5 a. What is cooling of transformer? List different methods of cooling and explain any of them. (06 Marks)
- b. Define armature reaction, with neat diagram explain armature reaction in DC generator. (08 Marks)
- c. Explain the procedure in obtaining equivalent circuit parameters for three winding transforms. (06 Marks)

OR

- 6 a. Derive EMF equation of an alternator. Also give the expression for pitch factor and distribution factor. (10 Marks)
- b. What is commutation? Explain the problems associated with commutation in DC generator and discuss the methods to overcome problems. (10 Marks)

Module-4

- 7 a. Define voltage regulation of the alternator and explain the ampere turn method of predetermination of regulation. (08 Marks)
- b. A 3-phase star connected synchronous generator supplies current of 10A having phase angle of 20° lagging at 400V. Find the load angle and components of armature current ' I_a ' and I_Q if $X_d = 10\Omega$ and $X_d = 6.5\Omega$. Assume armature resistance to be negligible. (12 Marks)

OR

- 8 a. Explain the method of determining voltage regulation of alternator by MMF method with all necessary circuit diagrams in the test. (12 Marks)
- b. A 2300V, 50Hz, 3 ϕ star connected alternator has an effective armature resistance of 0.2Ω . A field current of 35A produces a current of 150A on short circuit and open circuit emf 780V (line) calculate the voltage regulation at 0.8pF lagging and 0.8pF leading for the full load current of 25A. (08 Marks)

Module-5

- 9 a. Mention the necessary condition for synchronization of alternators. Explain the lamp dark and lamp bright method of synchronization of alternators. (12 Marks)
- b. Write short notes on hunting in synchronous machine. Also explain the role of damper winding. (08 Marks)

OR

- 10 a. Write a note on capability curves of synchronous generator. (06 Marks)
- b. What is short circuit ratio? Explain the significance of SCR. (06 Marks)
- c. With a neat diagram, explain the method of determination of X_d and X_q of salient pole alternator. (08 Marks)

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