CBCS SCHEME

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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 3ϕ 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 = 0.15Ω, equivalent reactance = 0.37Ω, core loss component of resistance = 600Ω, magnetizing reactance = 300Ω. When the transformer is supplying load of 10A at a P.F of 0.8kg 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 communication 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, 3ϕ star connected alternator has an effective armature resistance of 0.2Ω. A field current of 35A produces a current of 150A an 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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