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Third Semester B.E. Degree Examination, Feb./Mar. 2022 Transformers 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. With the help of phasor diagram, explain the operation of practical transformer on load. (06 Marks)
- b. Find the all day efficiency of single phase transformer having a maximum efficiency of 98% at 15KVA, UPF and loaded as follows:
12 hours → 2kW, 0.5pf lagging
6 hours → 2kW, 0.8pf lagging
6 hours → no load. (08 Marks)
- c. Explain with neat circuit diagram and phasor diagram the operation of star-star connected 3 phase transformer. (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. A 5KVA, 500/250V, 50Hz single phase transformer gave the following readings,
OC test : 500V, 1A, 50W [LV side open]
SC test : 25V, 10A, 60W [LV side shorted]
Determine:
i) Efficiency on full load and 0.8pf lagging.
ii) Voltage regulation on full load and 0.8pf leading.
iii) Efficiency on 60% of full load and 0.8pf leading.
iv) Draw the equivalent circuit referred to primary and insert all values in it. (10 Marks)
- c. Mention the advantages of delta-delta connected 3 phase transformer [Any four]. (04 Marks)

Module-2

- 3 a. With a neat circuit diagram, explain Sumpner's test conducted on two identical transformers. Also show how efficiency and regulation are calculated from Sumpner's test data. (08 Marks)
- b. Why parallel operation two single phase transformers are needed and mention the necessary conditions to be satisfied for parallel operation. (06 Marks)
- c. With a neat diagram, explain the operation of on-load tap changer. (06 Marks)

OR

- 4 a. 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)
- b. Obtain the expression for load sharing during the parallel operation of two transformers having same voltage ratios. (06 Marks)
- c. Explain how the Eddy current losses and hysteresis losses are separated in a single phase transformer. (04 Marks)

Module-3

- 5 a. Explain how the equivalent circuit parameters are obtained for a three winding transformers. (08 Marks)
- b. What is armature reaction in DC machines? Explain how armature reaction produces demagnetizing and cross magnetizing effect. Also derive the necessary expressions for demagnetizing and cross magnetizing ampere turns. (08 Marks)
- c. Write short notes on concentrated and distributed winding in a synchronous generator. (04 Marks)

OR

- 6 a. Derive the Emf equation of an alternator. Also derive an expression for pitch factor and distribution factor. (10 Marks)
- b. What is commutation? With a neat diagram, explain the process of commutation. (06 Marks)
- c. Mention reasons for using three winding transformers. (04 Marks)

Module-4

- 7 a. Explain the method of determining voltage regulation of synchronous generator by ZPF method with all the circuit diagram necessary in the test. (12 Marks)
- b. The OC and SC test readings for a 3 ϕ star connected 1000KVA, 2000V, 50Hz alternator are

I_f	10	20	25	30	40	50
V_{OC} line voltage	800	1500	1760	2000	2350	2600
I_{asc}	-	200	250	300	-	-

The armature resistance is 0.2 Ω /ph. Draw the characteristic curves and estimate the percentage regulation by EMF method at i) FL, 0.8pf lag ii) FL, 0.8pf lead. (08 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. Derive the expression for EMF induced in terms of terminal voltage, load current, armature resistance, synchronous reactance along with phasor diagram for lagging and leading PF load. (08 Marks)

Module-5

- 9 a. Mention the necessary conditions 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 windings. (08 Marks)

OR

- 10 a. With a neat circuit diagram, explain the method of determination of X_d and X_q of salient pole alternators. (10 Marks)
- b. Write short notes on capability curves of a synchronous generators. (06 Marks)
- c. Mention any four advantages of operating alternators in parallel. (04 Marks)

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