USN ☐☐☐☐☐☐☐☐☐☐

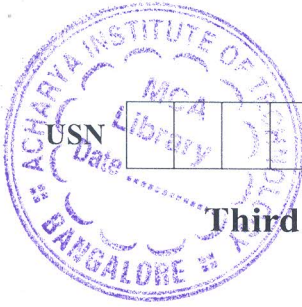## Third Semester B.E. Degree Examination, Jan./Feb. 2023
Transformers and Generators

Time: 3 hrs.

Max. Marks: 80

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

Module-1

1   a. Why the short circuit test is performed at reduced voltage on HV side of a transformer? Why the core loss is almost negligible in this test? **(04 Marks)**

    b. Draw an equivalent circuit of a single phase 2 KVA transformer by using the test results and find the circuit parameters referred to primary side. **(06 Marks)**

OC test		
V_O	I_O	W_O
230 V	0.346 A	38 W

SC test		
V_{SC}	I_{SC}	W_{SC}
15.7 V	8.66 A	128 W

    c. Define voltage regulation of a transformer and derive the condition for zero voltage regulation. **(06 Marks)**

OR

2   a. What is meant by three phase transformer vector groups? What is the significance of these groups? **(04 Marks)**

    b. Explain with the help of connection and phasor diagrams, how Scott connections are used to obtain two phase supply from three phase supply mains. **(08 Marks)**

    c. A balanced 3 phase load of 150 KW at 1000 V, 0.866 lagging power factor is supplied from 2000 V, three phase mains through single phase transformers assumed to be ideal connected in (i) delta-delta   (ii) V-V. Find the current in windings of each transformer. **(04 Marks)**

Module-2

3   a. What are the applications of autotransformers? **(04 Marks)**

    b. Explain the advantages of using a tertiary winding in a bank of star-star transformers. **(04 Marks)**

    c. Derive an expression for the currents shared by between two transformers connected in parallel supplying a common load when no load voltages of these transformers are unequal. **(08 Marks)**

OR

4   a. Compare two winding transformer with autotransformer. **(05 Marks)**

    b. Discuss the necessary conditions for parallel operation of two transformers. **(05 Marks)**

    c. Explain the operation of an on-load tap changer. **(06 Marks)**

Module-3

5   a. What are the factors impose to produce noise in transformer? How it can be reduced? **(06 Marks)**

    b. Explain regenerative test on transformer. How can it be used for measurement of efficiency? **(06 Marks)**

    c. Write a note on interpoles. **(04 Marks)**

OR

6 a. Describe the effects of armature reaction on operation of DC machine. How the armature reaction is minimized? **(08 Marks)**

b. Calculate the r.m.s. value of line and phase induced emf of a 10 pole, 3 phase, 50 Hz, alternator with 2 slots/pole/phase and 4 conductors per slot. The coil span is 150° electrical. The flux/pole has a fundamental component of 0.15 Wb and 20% third harmonic, 6% fifth harmonic component. **(08 Marks)**

Module-4

7 a. What do you mean by synchronizing of alternators? Describe any one method of Synchronizing. **(06 Marks)**

b. Explain power angle characteristics of salient pole synchronous machine. **(05 Marks)**

c. Write a short note on V-curves on synchronous generator. **(05 Marks)**

OR

8 a. Derive an expression for finding voltage regulation of salient pole alternator using two reaction theory. Draw its phasor diagram. **(08 Marks)**

b. A 3 phase star connected synchronous generator supplies current of 10 A having phase angle of 20° lagging at 400 V. Find the load angle and components of armature current I_a and I_q, if $X_d = 10\ \Omega$ and $X_q = 6.5\ \Omega$. Assume armature resistance to be negligible. **(08 Marks)**

Module-5

9 a. What is Potier reactance? Explain the Potier-triangle method of determining the voltage regulation of an alternator. **(08 Marks)**

b. A 220 V, 50 Hz, 6 pole star connected alternator with armature resistance 0.06 Ω/phase gave the following data for open circuit and short circuit characteristic. Find the percentage voltage regulation at full load current of 40A at a power factor of 0.8 lagging by mmf method.

I_f in Amps	0.2	0.6	1.0	1.4	1.8	2.6	3.4
$V_{OC/ph}$ Volts	16.7	53.5	84.3	112	134	164	179
I_{SC} in Amps	6.6	20	32.4	46.3	59.0	-	-

(08 Marks)

OR

10 Write short notes on:

a. Capability curves **(05 Marks)**

b. Hunting and damping **(05 Marks)**

c. Short circuit ratio and its significance **(06 Marks)**

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