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Third Semester B.E. Degree Examination, Aug./Sept. 2020 Transformers and Generators

Time: 3 hrs.

Max. Marks: 80

**Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume Missing data if any.**

Module-1

- 1 a. Draw the exact equivalent circuit of a single phase transformer. From this derive the approximate and simplified equivalent circuit of the transformer. (08 Marks)
- b. A three phase transformer bank consisting of three 1-phase transformers is used to step down the voltage of a 3-phase, 6600V transmission line. If the primary line current is 10A, calculate the secondary line voltage, line current and output KVA for the following connections.
 i) Y/Δ (Star/Delta) ii) Δ/Y (Delta/Star)
 The turn's ratio is 12, Neglect losses. (08 Marks)

OR

- 2 a. A single phase 250/500V transformer gave the following results :
 Open circuit test : 250V, 1A, 80W on l.v side
 Short circuit test : 20V, 12A, 100W on h.v side
 Calculate the circuit constants and shown them on equivalent circuit. (08 Marks)
- b. Explain with the help of connections and phasor diagrams how scott connections are used to obtain two phase supply from three phase supply mains. (08 Marks)

Module-2

- 3 a. What are the conditions for the satisfactory parallel operation to single phase transformers? Deduce the expressions for the load shared by two transformers in parallel when no-load voltages of these transformers are not equal. (08 Marks)
- b. Enumerate the various purposes which dictate the use of a tertiary winding. Obtain the equivalent circuit of a three winding transformer. (08 Marks)

OR

- 4 a. Two transformers A and B are connected in parallel to a load of $(2 + j1.5)$ ohms, their impedances in secondary terms are $Z_A = (0.15 + j 0.5)$ ohms and $Z_B = (0.1 + j 0.6)$ ohms. Their no load voltages are $E_A = 207 \angle 0^\circ$ volt and $E_B = 205 \angle 0^\circ$ volt. Find the power output and power factor of each transformer. (08 Marks)
- b. Derive an expression for saving in conductor material in an autotransformer over a two-winding transformer of equal rating, state the advantages and disadvantages of autotransformers over two-winding transformers. (08 Marks)

Module-3

- 5 a. What are the causes and effects of harmonics in the transformers? How the effects of harmonics are minimized? (06 Marks)
- b. What is armature reaction? Explain with neat sketches the effect of armature reaction is DC Generators. (05 Marks)
- c. Define the terms synchronous reactance and voltage regulation of an alternator. (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. With a neat circuit diagram, explain the Sumpner's test on single phase transformer. (05 Marks)
- b. Define commutation. Explain the process of commutation in DC Generators with neat sketches. (06 Marks)
- c. Derive emf equation for an alternator, explain the significance of winding factor. (05 Marks)

Module-4

- 7 a. Explain Synchronous Generator load characteristics. (08 Marks)
- b. Explain the two reaction theory applicable to salient pole synchronous machine. (08 Marks)

OR

- 8 a. What do you mean by Synchronizing of Alternators? What are the conditions for Synchronization? Describe any one method of Synchronizing of Alternators. (08 Marks)
- b. Explain the determination X_d and X_q of a salient pole synchronous machine by slip test. (08 Marks)

Module-5

- 9 a. Explain how open circuit and short circuit tests are conducted on a Synchronous and Generator. What is the air gap line? (08 Marks)
- b. What do you mean by hunting of a Synchronous Generator? What are causes and effects of hunting? How the hunting effects are reduced? (08 Marks)

OR

- 10 a. From the following test results, determine the voltage regulation by EMF method of a 2000V 1-phase alternator delivering a current of 100A at
- unity power factor
 - 0.8 leading power factor
 - 0.71 lagging power factor.
- Test results: Full load current of 100A is produced on short circuit by a field excitation of 2.5A. An emf of 500V is produced on open circuit by the same excitation. The armature resistance is 0.8 ohms. (08 Marks)
- b. What is capability curve of a Synchronous Generator? Draw the capability curve of synchronous generator. (08 Marks)

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