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15EE33

Third Semester B.E. Degree Examination, Feb./Mar. 2022 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 suitably.

Module-1

- 1 a. Explain clearly the operation of Practical Transformer on NO – LOAD, with the help of Phasor diagram. (06 Marks)
- b. Develop and explain an Equivalent circuit of single phase transform, that shows parameters of Primary and Secondary windings combined together to give a simplified circuit referred to Primary side. (06 Marks)
- c. A 3300 / 300V single phase transformer gives 0.6 Amps and 60 watts as Ammeter and Wattmeter readings when supply is given to the LV winding and HV winding is kept open. Find i) Power factor of no – load current ii) Magnetizing current component iii) Iron loss component. (04 Marks)

OR

- 2 a. Give clear differences between Choice of single unit three phase Transformer and a Bank of three single phase transformers. (06 Marks)
- b. With the help of circuit diagram, show that Open – Delta connected three – phase transformer has KVA rating of 57.7% of that of Delta – Delta connected three – phase transformer. (04 Marks)
- c. A three phase step – down transformer with per phase turns ratio 47.6:1 connected in Delta – Star and is supplying a load of 400 KW, 0.8 lagging power factor at 400V. Sketch the connection diagram and show in it different line voltages and currents. (06 Marks)

Module-2

- 3 a. Explain in brief need of connecting the two or more transformers in parallel and conditions for satisfactory operation of these transformers. (06 Marks)
- b. Derive an expression for Load shared by two Transformer connected in parallel supplying a common load when voltages of these transformers are EQUAL. (05 Marks)
- c. The Primary and Secondary voltages of an Auto – transformer are 230V and 75V respectively. Calculate the current in different parts of winding when load current is 200 Amp. Also calculate the saving of copper. (05 Marks)

OR

- 4 a. What is an Auto – Transformer? Derive an expression for the copper saving in this transformer as compared to two winding transformer. (06 Marks)
- b. Explain how stabilization is achieved in three phase star – star connected transformer due to Tertiary winding. (05 Marks)
- c. With a neat circuit diagram, explain working of Tap – changing Off – circuit voltage regulator. (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.

Module-3

- 5 a. Explain in brief, Inrush current in transformer and its causes. (05 Marks)
 b. With a neat circuit diagram, explain the procedure for Sumpner's test to determine efficiency of two similar transformers. (06 Marks)
 c. Draw and explain the characteristics of DC Series generator. (05 Marks)

OR

- 6 a. Discuss the comparison between the following windings in an alternator :
 i) Single layer and Double layer windings ii) Full pitch and Fractional pitch windings (06 Marks)
 iii) Concentrated and Distributed windings.
 b. Derive an expression for Pitch factor and Distribution factor of an alternator with usual notation. (05 Marks)
 c. Find the no – load phase and line voltage of a star – connected 3 – phase, 6 – pole alternator which runs at 1200 rpm, having flux per pole 0.1 wb sinusoidally distributed. Its stator has 54 slots having double layer winding. Each coil has 8 turns and the coil is chorded by one slot. (05 Marks)

Module-4

- 7 a. What are the conditions to be satisfied when an alternators are connected in parallel? Explain with a sketch, synchronization of an alternator connected to infinite bus bars. (06 Marks)
 b. Explain in brief, the power angle characteristic of synchronous generator. (04 Marks)
 c. A Synchronous generator has a direct axis reactance of 0.8 per unit and a Quadrature axis reactance of 0.5 per unit. It is supplying full – load at rated voltage at 0.8 power factor lagging. Find the open circuit voltage. (06 Marks)

OR

- 8 a. With a neat circuit diagram, explain the Slip – Test on salient pole alternator to determine X_d and X_q . (08 Marks)
 b. Explain the behavior of synchronous generator on constant load under variable excitation connected to infinite bus bar. (08 Marks)

Module-5

- 9 a. Explain clearly, the step by step procedure to determine the Regulation of an alternator by ZPF method. (10 Marks)
 b. Define and explain short circuit ratio of Synchronous generator. What is its significance? (06 Marks)

OR

- 10 a. Explain clearly with OCC and SC curves of an alternator to determine its Regulation by EMF and MMF method. (10 Marks)
 b. A 600V, 60 KVA, single phase alternator has an effective resistance of 0.2 ohm. A field current of 10 Amp produces an armature current of 210 Amp on short – circuit and an emf of 480 V on Open circuit. Calculate i) Synchronous Impedance and Reactance.
 ii) Voltage regulation at 0.8 p.f lagging and
 iii) Voltage regulation at 0.6 power factor leading. (06 Marks)
