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15EE33

Third Semester B.E. Degree Examination, Dec.2019/Jan.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. Derive an equivalent circuit of a single phase transformer and show that the parameters of the primary and secondary winding may be combined to give a simplified equivalent circuit referred to primary side. **(08 Marks)**

   b. A 3ϕ transformer of ratio 33/6.6KV delta/star 2MVA has a primary resistance of 8Ω per phase and a secondary resistance of 0.08 per phase. The percentage of impedance is 7% calculate the secondary load voltage with rated primary voltage and hence the regulation for full load 0.75p.f. lagging condition. **(08 Marks)**

OR

2 a. The following readings are obtained from O.C. and S.C tests on 8KVA 400/120V, 50Hz transformer.
   O.C test (L.V side) : 120V ; 4A ; 75W
   S.C test (H.V side) : 9.5V ; 20A ; 110W
   Calculate:
   i)   The equivalent circuit constants.
   ii)   Voltage regulation and efficiency for 0.8 lagging power factor full load.
   iii) The efficiency at half load and 0.8 p.f. load. **(08 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)**

Module-2

3 a. What are the conditions necessary for satisfactory parallel operation? **(04 Marks)**

   b. What are the advantages of the Sumpner's test? **(04 Marks)**

   c. Two 250KVA transformers supplying a network are connected in parallel on both primary and secondary sides. Their voltage ratios are the same. The resistance drops are 1.5% and 0.9% and the reactance drops are 3.33% and 4% respectively. Calculate the KVA loading on each transformer and its power factor when the total load on the transformers is 500KVA and at 0.707 lagging power factor. **(08 Marks)**

OR

4 a. 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)**

   b. Write a brief note on:
   i)   Polarity test
   ii)   On load tap changing of transformer. **(08 Marks)**

Module-3

5 a. What is armature reaction? With neat figures explain armature reaction in D.C. machine under normal working condition. **(08 Marks)**

b. A 3φ star connected alternator on open circuit is required to generate a line voltage of 3.4KV, 50Hz. When driven at 500rpm. The stator has 3 slots/pole/phase and 10 conductors/slot. The coils are short chorded by 1 slot. Calculate the number of poles and useful flux/pole. **(08 Marks)**

OR

6 a. Derive the Emf equation of a synchronous generator. Define distribution factor and pitch factor. **(08 Marks)**

b. An 8 pole wave wound d.c. generator has 480 armature conductors. The armature current is 200A. Find the armature reaction demagnetizing and cross magnetizing ampere turns per pole, if
i) Brushes are on G.N.A.
ii) Brushes are shifted 6° electrical from G.N.A. **(08 Marks)**

Module-4

7 a. With a neat phasor diagram derive an expression for the power output of a salient pole alternator. Draw the variation of power, V_s, load angle δ. **(08 Marks)**

b. Explain the behavior of synchronous generator on no load under variable excitation connected to infinite bus bar. **(08 Marks)**

OR

8 a. Two 6600 volt, star connected alternators operating in parallel supply with the following loads:
i) 400kW at UPF
ii) 1000kW at 0.71 p.f. lag
iii) 400kW at 0.8 p.f lag
iv) 300kW at 0.9 p.f lag.
The armature current of one machine is 110A, at a p.f. of 0.9 lag. Find the output armature current and p.f. of the other machine. **(08 Marks)**

b. What is synchronizing of alternators? What are the conditions for proper synchronization of alternators? How three phase alternators are synchronized? **(08 Marks)**

Module-5

9 a. Describe the synchronous impedance method to determine regulation of an alternator for lagging and leading power factor. **(10 Marks)**

b. Define short circuit ratio and explain its significance. **(06 Marks)**

OR

10 a. Define regulation of an alternator. Explain the potier reactance method of finding regulation of an alternator. **(10 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 on short circuit and an open circuit emf 780V (line). Calculate the voltage regulation at 0.8pf. lagging and 0.8 p.f. leading for the full load current of 25A. **(06 Marks)**

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