CBCS SCHEME

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17EE33

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Explain the Operation Practical Transformer on – load , with the help of phasor diagrams. **(07 Marks)**

b. A single phase , 250/500V Transformer gave the following results :
Open circuit Test : 250V, 1A , 80W on low voltage side.
Short circuit Test : 20V, 12A, 100W on high voltage side.
Calculate the circuit constants and show them on an equivalent circuit. **(08 Marks)**

c. Compare a single unit three – phase transformer with a bank of three single – phase transformer. **(05 Marks)**

OR

2 a. Develop the exact equivalent circuit of a single – phase transformer. From this derive the approximate and simplified equivalent circuits of the transformer. State the assumptions made. **(07 Marks)**

b. Explain how the open and short circuit tests are conducted on transformer to calculate the equivalent circuit parameters. **(07 Marks)**

c. Calculate the ratings and turns ratio of a three – phase transformer to transform 10,000 KVA from 220 KV to 6600V, if the transformer is to be connected in i) $Y - \Delta$ ii) $\Delta - Y$. **(06 Marks)**

Module-2

3 a. Explain with a neat sketch, the Sumpner's test on single phase transformer. **(07 Marks)**

b. Explain the necessity and necessary conditions for parallel operation transformers. **(08 Marks)**

c. An auto transformer supplies a load of 3KW at 115 volts at UPF. If the applied voltage is 230V, calculate the power transferred to the load i) Inductively ii) Conductively. **(05 Marks)**

OR

4 a. Two transformers A and B are joined in parallel to the same load. Determine the current delivered by each transformer, given : Open circuit emf 6600V for A and 6400V for B. Equivalent leakage impedance in terms of secondary $(0.3 + j3)_\Omega$ for A and $(0.2 + j1)_\Omega$ for B. The load impedance is $(8 + j6)_\Omega$. **(08 Marks)**

b. Derive an expression for the saving of copper in auto transformer as compared to an equivalent two winding transformer. **(07 Marks)**

c. Explain with the help of figure, the working of an load tap changing transformer. **(05 Marks)**

Module-3

5 a. What are the purposes for which Tertiary windings are used? **(06 Marks)**

b. Explain with the help of neat sketches, the effects of armature reaction in DC machines. **(08 Marks)**

c. A 3 phase, 16 pole synchronous generator has a resultant air gap flux of 0.06 wb per pole. The flux is distributed sinusoidally over the pole. The stator has 2 slots per pole per phase and 4 conductors per slot are accommodated in two layers. The coil span is 150^0 electrical. Calculate the phase and line induced voltages when the machine runs at 375 rpm. **(06 Marks)**

OR

6 a. What do you mean by three winding transformer? Deduce the equivalent circuit of a 3 – winding transformer. **(06 Marks)**

b. A 4 – pole generator has a wave wound armature with 722 conductors and it delivers 100A on full load. If the brush lead is 8^0, calculate the armature demagnetizing and cross – magnetizing ampere turns per pole. **(06 Marks)**

c. Derive the expressions for pitch factor and distribution factors in connection with alternator armature windings. **(08 Marks)**

Module-4

7 a. What is the necessity and necessary conditions for parallel operation of Alternator? Explain the synchronization of Alternators by synchronizing lamp method. **(08 Marks)**

b. Write a note on 'V' curves of Alternator. **(04 Marks)**

c. Explain with the help of circuit diagram, the slip test on salient pole synchronous machine for determination of direct and quadrature axis synchronous reactants. **(08 Marks)**

OR

8 a. Explain the generator load characteristics. **(06 Marks)**

b. With the help of phasor diagram, explain the concept of two reaction theory for salient pole synchronous machine. **(08 Marks)**

c. Derive the expression for synchronizing power. **(06 Marks)**

Module-5

9 a. Sketch and explain the open circuit and short circuit characteristics of a synchronous machine. **(08 Marks)**

b. From the following test results, determine the voltage regulation of a 2000V, 1 ϕ alternator delivering a current of 100A, at i) UPF ii) 0.8 leading p.f and iii) 0.71 lagging pf.
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 0.8Ω. **(07 Marks)**

c. What are the causes and effects of hunting? **(05 Marks)**

OR

10 a. Define SCR (Short Circuit Ratio). What is the significance of SCR on performance of synchronous machine? **(07 Marks)**

b. Explain the Synchronous Impedance method of determining the voltage regulation of alternators. **(08 Marks)**

c. What do you mean by Hunting in Alternators? How the effects of Hunting are reduced? **(05 Marks)**

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