

CBCS Scheme

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15EE33

Third Semester B. E Degree Examination, June/July 2017

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. With the help of phasor diagram. Explain the operation of practical transformer on load. (06 Marks)
- b. A 3-phase step down transformer with per phase turns ratio 47.6:1 connected in delta/star and is supplying a load of 400kW, 0.8 p.f lagging at 400V. Calculate different line voltages and currents. (06 Marks)
- c. Write a short note on All day efficiency. (04 Marks)

OR

- 2 a. State the advantages of single 3-phase unit transformer over bank of single phase transformers. (06 Marks)
- b. Show that open delta connection of 3-phase transformers has KVA rating of 57.7% of that of delta-delta connection. Show the connection diagram. (05 Marks)
- c. A 4-KVA, 200/400V single phase transformer supplying full load current of 0.8 p.f lagging. The OC/SC test results are : OC Test : 200V, 0.8A, 70W
SC Test : 20V, 10 A, 60W (HV side)
Calculate : Efficiency (05 Marks)

Module-2

- 3 a. Derive an expression for the currents and load shared by two transformers connected in parallel supplying a common load when no load voltages of these are equal. (06 Marks)
- b. The primary and secondary voltages of an autotransformer are 230V and 75V respectively. Calculate the currents in the different parts of the winding when load current is 200A. Also calculate saving of copper. (06 Marks)
- c. Explain why tertiary winding is used. (04 Marks)

OR

- 4 a. Explain how stabilization is achieved using tertiary winding. (04 Marks)
- b. With the help of sketches explain the working of on load tap changer. (06 Marks)
- c. Two single phase transformers, rated at 250KVA each are operated in parallel on both sides. Impedances of transformers are $(1+j6)\Omega$ and $(1.2 + j4.8)\Omega$ respectively. Find the load shared by each when the total load is 500KVA at 0.8 p.f lagging. (06 Marks)

Module-3

- 5 a. Write a short note on Noise in Transformer. (04 Marks)
- b. A 4-pole, lap wound armature running at 1400rpm delivers a current of 100A and has 64 commutator segments. The brush width is equal to 1.4 commutator segments and inductance of each armature coil is 0.05mH. Calculate the value of the reactance voltage assuming linear commutation. (06 Marks)
- c. Explain the methods used to reduce harmonics in three phase alternators. (06 Marks)

OR

- 6 a. Draw and explain the characteristics of DC shunt generator. (06 Marks)
 b. Explain the polarity test with the help of connection diagram. (04 Marks)
 c. A 4-pole, 3-phase, 50Hz star connected alternator has 60 slots with 4 conductors/slot. The coils are short pitched by 3 slots. If the phase spread is 60° , find the phase voltage induced for a flux/pole of 0.943 wb. sinusoidally distributed in space. All the turns/phase are in series. (06 Marks)

Module-4

- 7 a. Define voltage regulation of an alternator. (03 Marks)
 b. A 3-phase, 50Hz, 2-pole alternator is excited to generate the bus bar voltage of 11KV at no load. Calculate synchronizing power per degree of mechanical displacement of the rotor. The machine is star connected and the short circuit current for this excitation is 1200A. Neglect the armature winding resistance. (06 Marks)
 c. With phasor diagram, explain the concept of two reaction theory in a salient pole synchronous machine. (07 Marks)

OR

- 8 a. Explain the behaviour of synchronous generator on no load under variable excitation connected to infinite bus bar. (08 Marks)
 b. A 3-phase star connected synchronous generator supplies current of 10A having phase angle of 20° lagging at 400V. Find the load angle and components of armature current I_d 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. Write a short note on hunting and dampers. (06 Marks)
 b. A 50KVA, 500V, single phase alternator gave the following test results :
 OC Test : A field current of 12A produced an emf. of 300 volts.
 SC Test : A field current of 12A caused a current of 175A to flow in the short circuited armature
 The effective armature resistance is 0.2Ω .
 i) Calculate the synchronous impedance and synchronous reactance
 ii) If alternator is supplying full load current of 100A at 0.8p.f lagging, to what value would the terminal voltage rise if the load were removed? Also find the voltage regulation for this load and p.f. (10 Marks)

OR

- 10 a. Explain Potier reactance method. (08 Marks)
 b. A 2300V, 50Hz, 3-phase star connected alternator has an 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 0.8 p.g lagging and 0.8p.f leading for the full load current of 25A. (08 Marks)

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