CBCS SCHEME

USN | | | | | | | | | | **15EE33**

Third Semester B.E. Degree Examination, July/August 2021
## Transformers and Generators

Time: 3 hrs.   Max. Marks: 80

Note : 1. *Answer any FIVE full questions.*
2. *Missing data may be suitably assumed.*

1   a. Explain the operation of a practical transformer on no – load and draw the phasor diagram.
   (06 Marks)
   b. Explain with diagram, the open circuit test on a Single phase transformer. **(04 Marks)**
   c. A single phase 500V/250V, 10 KVA,50Hz transformer has a resistance of 0.2Ω and a reactance of 0.6Ω on H.V side. The corresponding values on the L.V side are 0.05 Ω and 0.15 Ω respectively. Calculate the percentage regulation on full – load at 0.7 p.f lagging and the full – load copper losses. **(06 Marks)**

2   a. Explain the delta – delta connection of three, Single phase transformers and show that V- V capacity is 57.7% of Δ - Δ capacity. **(06 Marks)**
   b. Explain the choice between star and delta connection in 3 – phase transformers. **(04 Marks)**
   c. The following test results were obtained for a 50kVA, 2200V/110V, 50Hz, 1 – phase transformer : O.C. test (L.V. Side) : 110V, 10A, 400W.
   S.C. test (H.V. Side) : 90V, 20.5A, 808W.
   Determine the equivalent circuit parameters referred to L.V. Side. **(06 Marks)**

3   a. What are the conditions for parallel operation of single phase and three phase transformers?
   (06 Marks)
   b. Two, 1 - phase transformers in parallel operation, Supply a load of impedance (2 + j1.5)Ω. The transformer impedances as referred to the secondary windings are (0.15 + j0.5) Ω and (0.1+j0.6) Ω respectively. The open circuit secondary emf's are 207V and 205V. Find
   i) The no – load circulating current   ii) Total power supplied to the load. **(10 Marks)**

4   a. Derive an expression for saving in copper in a step down auto – transformer over a two winding transformer of equal rating. **(05 Marks)**
   b. Explain the voltage regulation in transformers by Off – circuit tap changing. **(05 Marks)**
   c. Draw the equivalent circuit of a tertiary winding transformer and explain the procedure to determine its parameters. . **(06 Marks)**

5   a. Explain with diagram, the Sumpner's test on the transformers. **(06 Marks)**
   b. What is Commutation? Explain the full – load characteristics of a d.c shunt generator.
   (04 Marks)
   c. Define and derive the equations for Synchronous generator winding factors. **(06 Marks)**

6   a. What are the methods of Reduction and Elimination of harmonics in the generated emf?
   (06 Marks)
   b. What is Armature reaction in a synchronous generator? Explain its effect, with diagram at u.p.f load. **(04 Marks)**
   c. A three – phase , 16 pole, star connected synchronous generator has 192 slots with 8 conductors per slot. The coil span is 160^0 (ele), the speed of the generator is 375 rpm and the flux per pole is 55 mwb. Calculate the phase and line voltages. **(06 Marks)**
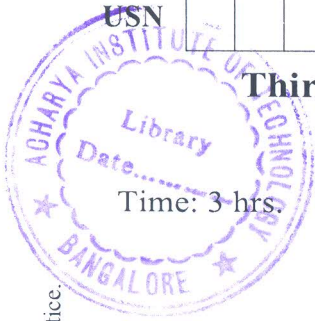
7   a. Define Voltage regulation of a Synchronous generator and explain its load characteristics.
        (05 Marks)
    b. With diagram, derive the relevant equations for load sharing between the two generators operating in parallel.
        (06 Marks)
    c. With load diagrams, explain the O – curves and V – curves.
        (05 Marks)

8   a. Draw the phasor diagram and derive the equation for electrical power output of a salient – pole generator.
        (05 Marks)
    b. With circuit diagram, explain the procedure of slip test. How can direct axis and quadrature axis reactance's found from this test?
        (05 Marks)
    c. A 300 MVA, 22KV, three phase salient – pole generator is operating at 250MW power output at a lagging p.f of 0.85 synchronized to 22KVbus. The generator reactances are $X_d = 1.93$pu and $X_q = 1.16$pu. Calculate the power angle and direct axis current.   (06 Marks)

9   a. Explain the procedure to obtain the Short circuit and Open circuit characteristics and hence Synchronous reactance.
        (06 Marks)
    b. A 5MVA, 6.6KV, three – phase star connected Synchronous generator has a resistance of 0.075 ohm per phase. Calculate the regulation for a load of 500A at 0.71 lagging p.f, from the following characteristics :

Field current :	32	50	75	100	140
O.C line voltage :	3100	4900	6600	7500	8300
ZPFC line voltage :	0	1850	4250	5800	7000

        (10 Marks)

10 a. Draw the capability curve of Synchronous generator. Mention the various bounds imposed on this machine.
        (06 Marks)
    b. With diagram, explain the control of Synchronous generators after Synchronizing. (05 Marks)
    c. What is Hunting? What are the techniques used to reduce hunting?
        (05 Marks)

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