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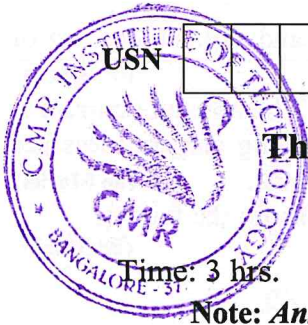
Third Semester B.E. Degree Examination, Jan./Feb. 2021
Transformers and Generators

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain practical transformer on no-load. **(04 Marks)**
   b. With the help of a neat circuit diagram and phasor diagram. Explain the operation of a 3-phase star-Delta transformer. **(06 Marks)**
   c. Draw the phasor diagram of a transformer supplying Lagging power factor load. **(04 Marks)**
   d. A 230/460V single phase transformer has a primary resistance of 0.2 ohm and a reactance of 0.5ohm and the corresponding values for the secondary are 0.75 ohm and 1.8 ohm respectively. Find the secondary terminal voltage when supplying 10A at 0.8 power factor lagging. **(06 Marks)**

OR

2 a. With neat circuit diagrams, discuss in detail how to perform OC and SC tests on single phase transformer. **(08 Marks)**
   b. Explain with circuit diagram and phasor diagram how two transformers connected in open delta can supply the power successfully. **(06 Marks)**
   c. Find the all day efficiency of a transformer having maximum efficiency of 98% at 15kVA at unity power factor and loaded an follows :
   12Hr 2kW at 0.5 power factor
   6 Hr 12kW at 0.8 power factor
   6 Hr No load. **(06 Marks)**

Module-2

3 a. With a neat circuit, explain how iron losses can be separated into hysteresis and eddy current losses in a transformer. **(08 Marks)**
   b. List the conditions to be satisfied for parallel operation of single phase and Three phase transformers. **(04 Marks)**
   c. Two 250kVA transformers supplying a network are connected in parallel on both primary and secondary sides. Their voltage ratios are same. The resistance drops are 1.5% and 0.9% and 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 at 0.707 lagging power factor. **(08 Marks)**

OR

4 a. Obtain the expression for current shared by two transformers with unequal voltage ratios connected in parallel. The transformers have unequal internal impedance. Also draw the phasor diagram. **(08 Marks)**
   b. In a 400V, 50Hz transformer, the total iron loss is 2500W. When the supply voltage and frequency reduced to 200V, 25Hz respectively the corresponding loss is 850W. Calculate the eddy current loss at normal voltage and frequency. **(06 Marks)**
   c. An auto transformer supplies a load of 3kW at 115V, unity power factor. If the applied voltage is 230V, calculate the power transferred to the load i) inductively ii) conductively. **(06 Marks)**

Module-3

5 a. What is Cooling of transformer? List different methods of cooling and explain any two of them. **(06 Marks)**

   b. An 8 pole wave wound DC generator has 480 armature conductors. The armature current is 200A. Find the armature reaction demagnetizing and cross magnetizing ampere turns per pole, if the brushes are shifted 6° electrical from Geometrical natural axis. **(06 Marks)**

   c. Define: i) Distribution factor   ii) Pitch factor. Derive the expressions for the factors. **(08 Marks)**

OR

6 a. Define Armature reaction in a DC generator. What are the effects of armature reaction? Explain. **(06 Marks)**

   b. With necessary diagrams, explain armature reaction in alternator for lagging, unity and leading power factors. **(06 Marks)**

   c. A 3 phase, 8 pole, star connected alternator has the armature coils short chorded by 1 slot. The coil span is 165° electrical. The alternator is driven at the speed of 750rpm. If there are 12 conductors per slot, and flux per pole is 50wmb, calculate the value of the induced emf across the terminals. **(08 Marks)**

Module-4

7 a. Define voltage regulation of the alternator and explain the Ampere turn method of predetermination of regulation. **(08 Marks)**

   b. Define Short Circuit Ratio (SCR). Explain its significance. **(04 Marks)**

   c. A 3 phase 2000KVA star connected 50Hz, 2300V alternator has a resistance between each pair of terminals as measured by direct current is 0.16ohm. The alternator gave a short circuit current of 600A for a excitation. With same excitation the open circuit voltage is 900V (line). Determine the full load regulation at i) unity power factor ii) 0.8pf lagging. **(08 Marks)**

OR

8 a. Explain the zero power factor method of predetermination of regulation of an alternator. **(08 Marks)**

   b. Compare synchronous Impedance method and Ampere turn method of predetermining of regulation. **(04 Marks)**

   c. A 3.5MVA, star connected alternator at 4160V at 50Hz has an pen circuit characteristics as given by the following data :

I_f, Amp	50	100	150	200	250	300	350
V_{oc}. Volts (Line)	1629	3150	4160	4750	5130	5370	5550

   A field current of 200A is found necessary to circulate full load current on short circuit. Calculate by Ampere turn method full load voltage regulation at 0.8pf lagging. **(08 Marks)**

Module-5

9 a. What is synchronization? Explain with the help of a neat sketch. The three lamps dark method of synchronization. **(08 Marks)**

   b. Derive an expression for the power angle characteristics of cylindrical rotor alternator. Sketch the power angle curve. **(06 Marks)**

   c. An alternator has a direct axis synchronous reactance of 0.7pu and a quadrature axis synchronous reactance of 0.4pu. It is used to supply full load at rated voltage at 0.8pf. Find the induced emf on open circuit. **(06 Marks)**

OR

10 a. With the help of a circuit diagram, explain the measurement of direct axis and quadrature axis reactances by slip test. **(08 Marks)**

   b. Draw and explain the capability curve of synchronous generator. **(06 Marks)**

   c. What is hunting in synchronous machines? How do you eliminate hunting? **(06 Marks)**