CBCS SCHEME

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18EE33

Third Semester B.E. Degree Examination, Aug./Sept.2020
Transformers and Generators

Time: 3 hrs. Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. With neat sketch, explain the open circuit and short circuit tests conducted on a single phase transformer to find efficiency at any load and to determine equivalent circuit parameters. **(08 Marks)**

b. Explain the operation of a single phase transformer with phasor diagram for lagging power factor load. **(06 Marks)**

c. Find the all day efficiency of 500 KVA distribution transformer whose copper loss and iron loss at full load are 4.5 KW and 3.5 KW respectively. During a day it is loaded as below:

Number of hours	6	10	4	4
Loading in KW	400	300	100	0
Power factor	0.8	0.75	0.8	-

(06 Marks)

OR

2 a. Explain with the help of connection and phasor diagram how SCOTT connections are used to obtain two phase from three phase mains. **(06 Marks)**

b. A 3 phase, 1000 KVA, 6600/1100 V transformer is delta connected on the primary and star connected on the secondary. The primary resistance per phase is 1.8 Ω and secondary resistance per phase is 0.025 Ω. Determine the efficiency when the secondary is supplying full load at 0.8 pf and the iron loss is 15 KW. **(08 Marks)**

c. Explain with neat circuit diagram and phasor diagram of Δ-Δ and open Δ type of transformer connections. **(06 Marks)**

Module-2

3 a. Derive an expression for the current shared by two transformers connected in parallel sharing a common load when no load voltage of both transformer are unequal. **(08 Marks)**

b. List out applications of autotransformer. Derive the expression for the saving of copper in an autotransformer compared to two winding transformer. **(08 Marks)**

c. Fig.Q3(c) shows an autotransformer used to supply a load of 2 kW at 230 V from a 400 V ac supply. Find the currents in parts AC and BC, neglecting losses and no load current. Assume resistive load. Also calculate the copper saving.

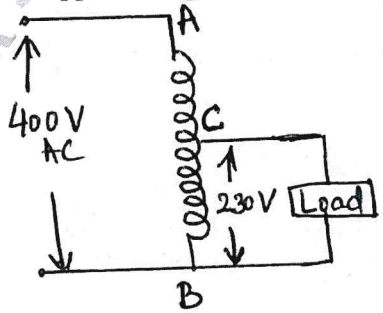

Fig.Q3(c) **(04 Marks)**

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OR

4 a. Write short notes on tap-changing transformers. **(06 Marks)**

b. What is the necessity of parallel operation of two single phase transformers? List all the necessary conditions of parallel operation of 1ϕ transformers. **(06 Marks)**

c. The short circuit test results of two transformers A and B are as below. On open circuit, both transformers gave a secondary voltage of 2200 V. The primary terminals are connected in parallel and 11000 V are applied to the primary.

	I_{SC}	V_{SC}	W_{SC}
Transformer A	10A	200 V	1000 W
Transformer B	30A	200 V	1500 W

Calculate the individual transformer current and power when supplying a load of 200 A at 0.8 pf lagging. Neglect no load currents. **(08 Marks)**

Module-3

5 a. Explain the procedure in obtaining equivalent circuit of three winding transformer. Draw the circuit referred to primary wdg. **(06 Marks)**

b. Write short notes on cooling of transformers. **(06 Marks)**

c. Define armature reaction. With neat diagram, explain armature reaction in DC generator. **(08 Marks)**

OR

6 a. Explain the problems associated with communication in DC generator and discuss the methods to overcome commutation problems. **(06 Marks)**

b. Derive the expression for distribution factor applicable in synchronous generator. Write the emf equation with winding factors. **(06 Marks)**

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

Module-4

7 a. Derive the expression for no load emf interms of terminal voltage, load current, armature resistance and synchronous reactance. Draw the vector diagram for lagging power factor load. **(06 Marks)**

b. Explain the method of voltage regulation of synchronous generator by EMF method. **(08 Marks)**

c. A 3ϕ Y connected alternator is rated at 1600 KVA, 13,500 volts. $R_a = 1.5\ \Omega$ and $X_s = 30\ \Omega$ per phase. Calculate the percentage regulation for a load of 1280 KW at a p.f. 0.8 lag and 0.8 lead. **(06 Marks)**

OR

8 a. The OC and SC test readings of a 3ϕ Y connected 1000 KVA, 2000 V, 50 Hz synchronous generator are

I_f Amps	10	20	25	30	40	50
OC line voltage	800	1500	1760	2000	2350	2600
SC current Amps	-	200	250	300	-	-

The armature resistance is 0.2 Ω/phase. Draw the characteristic curves and estimate the full load regulation at 0.8 pf lagging using Amper-Turn method. **(08 Marks)**

b. Explain ZPF method of voltage regulation of synchronous generator with all the circuit diagrams necessary in the test. **(12 Marks)**

Module-5

9 a. With neat circuit diagram, explain the method of determination of X_d and X_q of salient pole alternator. **(10 Marks)**

b. What are the conditions of synchronization of alternators? Explain the method of synchronization of alternators. **(10 Marks)**

OR

10 a. What is hunting in synchronous machines? Explain the role of damper winding. **(08 Marks)**

b. Write short notes on capabilities curves of synchronous generator. **(06 Marks)**

c. Write short notes on power angle characteristics of an alternator. **(06 Marks)**

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