CBCS SCHEME

USN | | | | | | | | | | |

18EE33

Third Semester B.E. Degree Examination, June/July 2023
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. Draw the no load phasor diagram of transformer. Express magnetizing current and loss component of the no load current in terms of the no load current and no load power factor. **(06 Marks)**

b. The following results were obtained a 50KVA, 2400/120V transformer :
O.C Test, Instruments, on L.V site
Wattmeter reading = 396W
Ammeter reading = 9.65A
Voltmeter reading = 120V
S.C Test, Instruments on h.r. site
Wattmeter reading =810W
Ammeter reading = 20.8A
Voltmeter reading = 92V
Determine :
i) The circuit constants
ii) Efficiency of full load, 0.8 p.f lagging
iii) Approximate voltage regulation 0.8p.f lag **(09 Marks)**

c. What are the advantages of transformer bank of three 1-phase transformer over a unit three phase transformer of the same KVA rating? **(05 Marks)**

OR

2 a. Explain with the help of connection and phasor diagrams, how Scott connections are used to obtain two phase supply form 3-phase supply mains. **(07 Marks)**

b. A 10 KVA single phase transformer rated for 2000/400 V has resistance and leakage reactances as follows :
Primary winding : $R_1 = 5.5\Omega$, $x_1 = 12\Omega$
Secondary winding : $R_2 = 0.2\Omega$, $x_2 = 0.45\Omega$
Determine the approximate value of the secondary voltage at full load 0.8 p.f lagging when the primary voltage is 2000V and also calculate the voltage regulation. **(06 Marks)**

c. A 2300/230V, 500KVA, 50Hz distribution transformer has core loss of 1600W at rated voltage and copper loss of 7.5kW at full load. During the day it is loaded as follows :

% load	0	20	50	80	100	125
Power factor	-	.7 lag	.8lag	.9 lag	1	.85 lag
Hours	2	4	4	5	7	2

Calculate all day efficiency. **(07 Marks)**

Module-2

3 a. State the need for parallel operation of transformers and also explain the various conditions of parallel operation of single phase transformer. **(06 Marks)**

b. Two single phase transformer having the same voltage ratio on no-load operate in parallel to supply a load of 1000KVA at 0.8 p.f lagging. One transformer is rated at 400 KVA and has equivalent impedance of $(0.015 + j\ 0.09)\Omega$, other is rated at 600 KVA and has a equivalent impedance of $(0.01 + j.05)\ \Omega$. Determine the load on each transformer in KVA and the operating power factor. **(07 Marks)**

c. Make a comparison in the weight of copper required in an auto transformer and a two winding transformer of the same rating. **(07 Marks)**

OR

4 a. Two similar 200 KVA, I-phase transformers gave the following results when tested by back-to-back method :
W_1 in supply line, 4kW, W_2 in series circuit, when full load current circulates through the secondaries, 6kW. Calculate efficiency of each transformer at .8p.f lag with full load condition. **(06 Marks)**

b. Explain how Iron loss can be separated into hysteresis loss eddy current loss. **(07 Marks)**

c. With help of sketches explain working of on load tap changing transformer. **(07 Marks)**

Module-3

5 a. Derive the equation for AT_d/pole and AT_c/pole. **(07 Marks)**

b. Derive the expression for pitch factor and distribution factors in connection with alternator. **(07 Marks)**

c. A 3-phase, 16-pole synchronous generator has a resultant air gap flux of 0.04ub per pole. The flux is distributed sinusoidaly over the pole. The stator has 2 slots per pole per phase and 6 conductors per slot are accommodated. The coil span is 160° electrical. Calculate phase and line induced voltages when the machine is runs at 375 rpm. **(06 Marks)**

OR

6 a. Explain the process of commutation in d.c generator with neat sketches. **(06 Marks)**

b. Explain the phenonomena of armature reaction when alternator is delivering a load current at i) purely lagging ii) unity iii) purely leading p.f **(09 Marks)**

c. Define term synchronous reactance and draw equivalent circuit diagram of the alternator. **(05 Marks)**

Module-4

7 a. Draw the phasor diagram a loaded alternator for the following conditions :
i) lagging p.f ii) leading p.f ii) upf. **(06 Marks)**

b. For cylindrical rotor alternator an expression for power developed a function of load angle **(07 Marks)**

c. A 3-phase, 1500KVA, star connected, 50Hz, 2300V alternator has a resistance of 0.12Ω. A files current 70A produces a short circuit current equal full load current of 376 A. The same field current produces an emf of 700V on open circuit. Determine the synchronous reactance of machine and its full load regulation at 0.8 p.f lagging. **(07 Marks)**

OR

8 a. Explain the Potier- triangle method of determining the voltage regulator of an alternator. **(10 Marks)**

b. A 3-phase, star connects, 1000KVA, 2000V, 50Hz alternator gave the following open circuit and short circuit ratings.

Fields current – (A)	10	20	25	30	40	50
O.C voltage (V) (LL)	800	1500	1760	2000	2350	2600
S.C current (A)	-	200	250	300		

The armature effective resistance per phase 0.2Ω. Determine the full load percentage regulation at 0.80 p.f leading using MMF method. **(10 Marks)**

Module-5

9 a. Explain the two reaction theory applicable to salient pole synchronous machine. **(07 Marks)**

b. What is necessity of parallel operation of alternator and list conditions necessary for paralling alternators. **(06 Marks)**

c. Explain the slip test to determine X_d and X_q **(07 Marks)**

OR

10 a. Write a note on capability curve for large turbo alternator. **(07 Marks)**

b. Derive expression for synchronizing power when two alternators are connected in parallel. **(06 Marks)**

c. What is hunting in an alternator? Discuss the measures to be taken to minimize hunting. **(07 Marks)**

* * * * *