DEHRADUN INSTITUTE OF TECHNOLOGY

DEPARTMENT OF ELECTRICAL ENGINEERING

EA32LO ELECTRICAL MACHINES

Assignement: - 2

1.) A 3300/230 V, 50 Hz single phase transformer is to be worked at a maximum flux density of 1.2 T in the core. The effective cross-sectional area of the core is 150 cm2. Calculate the suitable values of primary and secondary windings. [830,58]

2.) A single phase transformer has 550 primary turns and 40 secondary turns. The primary is connected to a 3300 V a.c. supply. Neglecting losses, calculate (a) secondary voltage, (b) the primary current when the secondary current is 200 A. [240 V, 14.6 A]

3.) The efficiency of a 20 kVA, 2500/250 V , single phase transformer at unity power factor is 98% at rated load and also at half rated load. Determine: (a) transformer core loss, (b) full-load copper loss, (c) per-unit value of the equivalent resistance of the transformer. [(a) 136 W, (b) 272 W, (c) 0.0136]

4.) A 100 kVA, 2000/200 V, 50 Hz distribution transformer has core loss of 500 W at rated voltage and copper loss of 1200 W at full load. It has the following load cycle:

% load	0%	50%	75%	100%	110%
Power factor	-	1	0.8 lag	0.85 lag	1.0
Hours	3	6	8	5	2

Determine the all-day efficiency of the transformer. [98.06%]

5.) Calculate the voltage regulation at 0.8 lagging power factor for a transformer which has an equivalent resistance of 2% and an equivalent leakage reactance of 4%. [4%]

6.) A 2 winding 10 kVA 440/110 V transformer is reconnected as a step-down 550/440 V autotransformer. Compare the volt-ampere rating of the autotransformer with that of original 2 winding transformer. Calculate the power transferred to the load inductively and conductively. [rating of auto t/f= 50 kVA, VA rating of 2 wdg. t/f=10 kVA, 10kVA, 40 kVA]

7.) Two single phase furnaces A and B are supplied at 80 V by means of a Scott-connected transformer combination from a 3 phase, 6600 V system. The voltage of furnace A is leading. Calculate the line currents on the 3 phase side when the furnace takes 500 kW and 800 kW respectively at unity power factor.[129 A,129 A, 87.6 A]

8.) A short shunt compound generator supplies a current of 100 A at a voltage of 220 V. The resistance of shunt field, series field and armature are 50 Ω, 0.025 Ω and 0.05 Ω respectively. The total brush drop is 2 V and the total iron and friction losses are 1000 V. Determine: (a) the generated voltage (b) the copper losses (c) the output of the prime mover driving the generator (d) generator efficiency. [(a) 229.72 V, (b) 1785.6 W, (c) 24785.6 W, (d) 88.76%)

9.) A shunt generator delivers 50 kW at 250 V when running at 400 rpm. The armature and field resistance are 0.02 Ω and 50 Ω respectively. Calculate the speed of the machine when running as a shunt motor and taking 50 kW input at 250 V. Allow 1 V per brush for contact drop. [381.3 rpm]

10.)A 500 V shunt motor takes 4 A on no load. The armature resistance including that of brushes is 0.2 Ω and the field current is 1 A. Estimate the output and the efficiency when the input current is (a) 20 A (b) 100 A [(a)2070.4,79.3%, (b) 3958.2, 92.1%]