
EEE3351 ASSIGNMENT 4

1. (a) Briefly describe the protection features built on a large power transformer.
- (b) A large power transformer's cooling system is an ONAN/ONAF/OFAF type. Under what loading conditions would the winding temperature monitoring device switch on the transformer cooling system to any of the three states?
2. (a) What important information do you find on the nameplate of transformers rated 500 kVA and above?
- (b) A transformer is to be loaded onto a low-loader truck after the oil is drained from the main tank and the LTC compartment. A 150 T crane is available. Using the information in the table below, is the crane's capacity adequate?

APPROXIMATE WEIGHT IN TONNES	
UNTANKING	70
TANK AND FITTINGS	50
OIL MAIN TANK 15000 GALS	55
OIL LTC COMPARTMENT 390 GALS	2
TOTAL WEIGHT	177

3. (a) A repair crew was making a TTR test on a 220-66 kV transformer and the test leads would not stretch from the HV bushings to the LV bushings, so the crew moved the TTR test set closer to the HV bushings to attach the clip test leads and connected the clamp to the LV bushings by extending them using jumper wire. The voltage and current indications on the TTR test set were normal, but the ratio measured 2.5% lower than the theoretical current. What was wrong? What is the correct way of doing this test when the test leads are shorter?

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- (b) A two-winding transformer has a primary winding with 208 turns and a secondary winding with 6 turns. The primary winding is connected to a 4160 V system. What is the secondary voltage at no-load? What is the current in the primary winding with a 50-amp load connected to the secondary winding? What is the apparent power flowing in the primary and secondary circuits?
4. A single-phase transformer rated 1.2 kV/120 V, 7.2 kVA has primary-referred parameters $R_1=r_1+a^2r_2=1.0 \ \Omega$ and $X_1=x_1+a^2x_2=4.0 \ \Omega$. At rated voltage its core loss may be assumed to be 40 W for all values of the load current. (a) Determine the efficiency and regulation of the transformer when it delivers 7.2 kVA at $V_2=120$ V and power factor of (i) 0.8 lagging, (ii) 0.8 leading. (b) For a given load voltage and power factor it can be shown that the efficiency of a transformer attains its maximum value at the kVA load level which makes the I^2R winding losses equal to the core loss. Using this result, determine the maximum efficiency of the above transformer at rated voltage and 0.8 power factor, and the kVA load level at which it occurs.
5. A single-phase transformer rated 1.2 kV/120 V, 7.2 kVA yields the following test results:
Open-circuit test (primary open): Voltage $V_2=120$ V; Current $I_2=1.2$ A; Power $W_2=40$ W.
Short-circuit test (secondary shorted): Voltage $V_1=20$ V; Current $I_1=6.0$ A; Power $W_1=36$ W.
Determine (a) the parameters $R_1=r_1+a^2r_2$, $X_1=x_1+a^2x_2$, G_c , and B_m referred to the primary side. (b) the values of the above parameters referred to the secondary side. (c) the efficiency of the transformer when it delivers 6 kVA at 120 V and 0.9 power factor.

Note: Assignment due on 6th December, 2013 before 17:00 hrs!