**ABES Engineering College, Ghaziabad**

**Department of Electrical & Electronics Engineering**

**Session:** 2023-24 **Semester:** II **Section:**

**Course Code: BEE-201** **Course Name:** Fundamentals of Electrical Engineering

## Tutorial Sheet-3

## Topic: Magnetic Circuits and Single Phase Transformer

| Q. No. | KL | CO | Question | Ans. |
|---|---|---|---|---|
| Q-1 | K3 | CO3 | A single phase transformer has 400 primary and 1000 secondary turns. The net cross- sectional area of the core is 60cm2 .If the primary winding be connected to a 50Hz supply at 500V,calculate the following:<br>(i) The peak value of the flux density in the core, and<br>(ii) The voltage induced in the secondary winding. | **(i) 0.9384 T**<br>**(ii) 1250 V** |
| Q-2 | K3 | CO3 | A 330/3300V, transformer takes a no load current of 5.5A and absorbs170watt. If the primary resistance is 0.08 Ω find (i) core losses, (II) No load power factor, (III) Active component of current and (IV) Magnetizing current | **(i) 167.58 Watt, (ii) 0.093 lagging, (iii) 0.515 A and (iv) 5.48 A** |
| Q-3 | K3 | CO3 | A 30KVA, 2000/200V, single phase, 50 Hz transformer has a primary resistance of 3.5 ohms and reactance of 4.5 ohms. The secondary resistance and reactance are 0.015 ohms and 0.02 ohms respectively. Find:<br>(i) Equivalent resistance, reactance and impedance referred to the primary side.<br>(ii) Equivalent resistance, reactance and impedance referred to the secondary side.<br>(iii) Total copper loss in the transformer first using separate winding resistances and verify answer with equivalent resistances | **R01 = 5Ω, X01=6.5 Ω: Z01=8.2Ω ; R02 = 0.05Ω, X02=0.065 Ω, Z02 =0.082Ω; Copper losses- 1125 watt** |
| Q-4 | K3 | CO3 | A voltage v=200sin314t is applied to a transformer at no load the the winding current is given by i=3sin(314t-60°).Determine core losses and No-load parameter of approximate equivalent circuit. | **150watt, Ro =133.42 Ω, Xm = 77 Ω** |
| Q-5 | K3 | CO3 | The ohmic values of the circuit parameters of a transformer, having a turns ratio of 5, are R1= 0.5Ω, R2=0.021Ω,X1=3.2Ω and X2=0.12Ω. If Ro=350 Ω and Xm=98 Ω referred to primary.Draw the approximate equivalent circuits of the transformer referred to secondary. | **R02 = 0.041Ω, X02=0.248 Ω, Ro = 14Ω and Xm= 3.92 Ω .** |

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| **Q-6** | **K3** | **CO3** | Calculate the voltage drop of a transformer in which ohmic losses are 1% and reactance drop is 5%. Consider pf. To be (i) 0.8 lagging, (ii) 0.8 leading and (iii) Unity. | **3.8 %, -2.2% and 1%** |
| **Q-7** | **K3** | **CO3** | The efficiency of a 400 KVA single phase transformer is 98.77% at full load 0.8 pf and 99.13 % at half load with unity power factor. Find iron and copper losses at half load . | **1.0117 KW and 0.743325 KW** |
| **Q-8** | **K3** | **CO3** | The primary and secondary windings of a 500KVA, single phase transformer have resistances of 0.4 Ω and 0.0015Ω respectively. The primary and secondary voltages are 6000V and 400V respectively and the iron loss is3.2KW. Calculate the efficiency at (I) full load and (ii) half load. Assuming the power factor of the load to be 0.8. | **97.962% and 97.81%** |
| **Q-9** | **K3** | **CO3** | A 40 KVA transformer has iron loss of 500 watts and full load copper loss of 800 watts. If the power factor of the load is 0.6 Lagging. Calculate .(i) Full load efficiency (ii)The load at which maximum efficiency occurs and (iii) The maximum efficiency. | **94.86% , 31.62 KVA and 94.99%** |
| **Q-10** | **K3** | **CO3** | A 20 KVA 2200/220V, 50 Hz transformer gave the following results:<br>OC Test : 220 V, 4.2A, 148 watt and SC Test : 86V,10.5A,360 watt. Find (i) Core losses at full load (ii) Cu losses at full load, (iii)Equivalent resistance and reactance on primary,(iv) Equivalent resistance and reactance on secondary, (v) efficiency at full load and at half load at 0.8 power factor lagging,(vi) Full load Voltage regulation at 0.8 pf. | **Core loss:148 W Cu losses: 270W R01= 3.26 Ω , X01= 7.51 Ω, R02= 0.0326 Ω , X02= 0.0751 Ω, Efficiency at full load =97.45% Efficiency at Half load = 97.38% and % regulation = 2.94%** |