ELL203 Electromechanics
Minor Test 1 Set A

Name:_____ Max Marks: 20

Venue: LH 111

Entry No:_____ Group No:_____ Date and Time: 28/8/'19 11 to 12 hrs

SHOW THE WORKING/ INTERMEDIATE STEPS WHEREVER REQUIRED.
NUMERICAL ANSWERS SHOULD BE ROUNDED OFF TO 2 DECIMAL PLACES AND WRITTEN WITH PROPER UNITS

1. Short Questions: (**Marks: 2+4+2+2**)
    a. An ideal transformer will have a magnetizing reactance of ___Infinity_Ω and core loss of __zero___Watts.
    b. A single-phase impedance of 3+j4Ω is fed by a 200V 50 Hz source. The rms current drawn by the load will be __40__A and its power factor will be ____0.6__. If voltage is taken as the reference phasor the current ___lags____(lags/ leads) the voltage by __53.13____degrees.
    c. The unit of flux density is __Tesla_ and the unit of reluctance is ___Amp/Wb__
    d. While measuring power in a 3-phase balanced circuit by two-wattmeter method, let the two Wattmeter readings be W1 and W2. If W1=W2, then the load power factor is __1__. If W1= -W2, then the load power factor is __zero___.

2. Long Questions: (**Marks: 3+7**)
    a. A current of 5 A is passed through a coil having 100 turns which is wound around a ferromagnetic core of mean length of 22cm with a cross sectional area of 5cm^2. If the flux in the core is 2.5 mwb, calculate the following (write the answers along with proper units):
        (i) MMF of this magnetic circuit is : 5x100=500AT

        (ii) The core reluctance is = 500/0.0025= 200x10^3 Amp/Wb = $l/(\mu_0\mu_r A)$

        (iii) The relative permeability of the core material = .22/(200x10^3 x4πx10^{-7}x5x10^{-4})=1750

    b. A single-phase 2.2kVA 220/440 V transformer has a maximum efficiency of 97.5% at 70% of rated load unity power factor condition. calculate the following (write the answers along with proper units):
        (i) Output = 0.7x2200=1540W; Losses=(1540/0.975) – 1540 = 39.49W
        Iron losses =(39.49/2)=19.74 W; Copper losses at rated load =19.74/0.7^2 =40.29W

        (ii) Its % resistance (% Req) is =40.29/2200= 1.83%

        (iii) If 660V AC supply is available from which 220V has to be derived at the output to feed a resistive load, what should be the maximum kVA that could be supplied by this transformer under such a connection without either of the windings being over-loaded?
        3.3 kVA (see the Figure below.

        (iv) What is the efficiency of this transformer under such an operating condition?
        3300/(3300+19.74+40.29) = 98.21%

(v) Draw the connection diagram indicating different currents along with their magnitudes.