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F.E. Semester –I (Revised Course 2016-17)
EXAMINATION JULY 2021
Fundamentals Of Electrical Engineering

[Duration : Two Hours]   [Total Marks : 60]

Instructions: 1) Answer THREE FULL QUESTIONS with ONE QUESTION FROM
                                       EACH PART
                                2) Assume suitable additional data if necessary.

PART-A

Q.1   a) State the explain the following laws related magnetism: 6
            i)   Ampere's law ii) Lenz's law

                                                                                            8
        b) Draw the typical layout of a Hydro-electric power plant and explain how it generates
            electrical energy.

                                                                                            6
        c) The total inductance of two coils P and Q when connected in series is 0.5H or 0.2H
            depending on the relative directions of the current in the coils. Coil P when isolated from
            Coil Q, has a self inductance of 0.2H. Calculate: (i) The mutual inductance between the
            two coils, (ii) The self inductance of coil Q, (iii) The coupling factor between the coils,
            (iv) The two possible values of the induced emf in coil P, when the current is decreasing
            at 1000A/sec in the series circuit.

Q.2   a) Derive an expression for energy stored in magnetic circuit.   6

        b) An iron core has a mean cross-sectional area of 0.005sq.m. and a mean circumference of   7
            0.2m. The iron core has a relative permeability of 16000. It is wrapped with 300 turns of
            wire carrying 0.5A of current. Calculate: (i) reluctance of the core, (ii) inductance of the
            core and coil, (iii) magnetic field intensity and (iv) magnetic flux density.

        c) In the series-parallel circuit shown in fig.(2c) , find   7
            (i) Voltage drop across 4Ω resistor
            (ii) supply voltage

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fig. (2c)
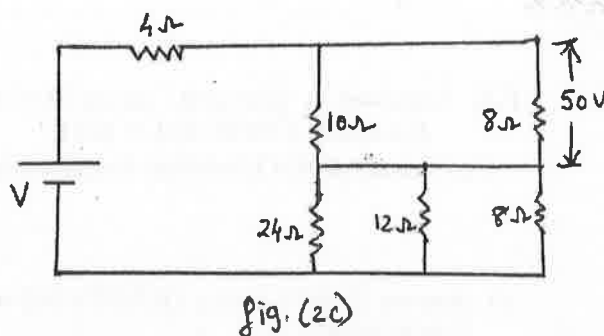
Q.3 a) State the explain Norton's theorem. 6

b) Explain the technology for conversion of wind energy to Electrical energy. 7

c) Using Superposition theorem, find the current I in the network shown in fig.(3c) 7

fig.(3c)
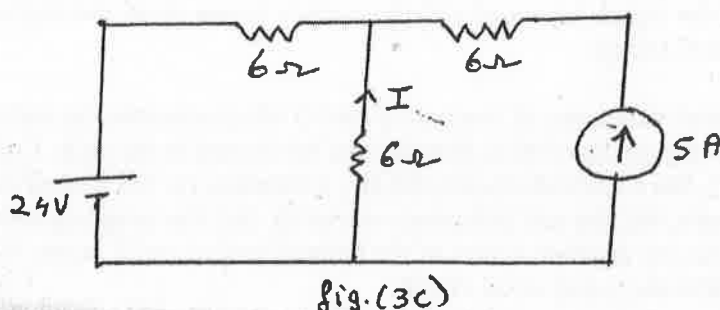
PART-B

Q.4 a) Define phase difference. With neat waveforms explain the concept of leading and lagging phase angle. Also define the term Power factor. 6

b) Graphically show the representation of a three phase system and explain the concept of phase sequence. 6

c) A series R-L circuit takes 10A and dissipates 1000W when connected to a supply of 250V, 50Hz. Calculate : (i) the impedance, (ii) the effective resistance, (iii) the reactance, (iv) the inductance (v) the power factor, Draw the vector diagram. 8

Q.5 a) Derive the expression for instantaneous current and instantaneous power in an AC circuit containing capacitance only. Draw neat and labeled waveforms and phasor diagram. 8

b) Briefly explain the following terms with respect to single phase transformer:
(i) Magnetic leakage (ii) Copper loss (iii) Voltage regulation (iv) efficiency
Also list down the different losses occurring in a Transformer. 6

c) A delta-connected load draws a current of 15A at a lagging power factor of 0.85 from a 6

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400V, 50Hz, three-phase supply. Calculate: (i) resistance and inductance of each phase (ii) power consumed.

Q.6   a) Define the following terms as related to ac quantities: **6**
(i) Waveform (ii) RMS value (iii) Form factor (iv) Frequency (v) Active power
(vi) Power factor

     b) In a star connected, three phase system, derive the relationship between line voltage and phase voltage, line current and phase current and the expression for total power consumed.   **8**

     c) A 6600/400V, single phase 600KVA single phase transformer has 1200 primary turns. Find (i) Transformation ratio, (ii) number of secondary turns (iii) voltage per turn, (iv) secondary current when it supplies a load of 400KW at 0.8 power factor lagging.   **6**

PART-C

Q.7   a) Derive the expression for dynamically induced EMF.   **6**

     b) State the explain Kirchoff's Current law and Kirchoff's voltage law.   **6**

     c) A circuit consists of 100Ω resistor in parallel with a $60\mu F$ capacitor and is connected to a 200V, 50Hz supply. Calculate: (i) the branch currents and the supply current, (ii) the circuit phase angle and (iii) the circuit impedance.   **8**

Q.8   a) A 3 phase, 400V, load takes an input of 40KW at 0.45 power factor lagging. Find the reading of each of the two single phase wattmeters connected to measure the input.   **6**

     b) Describe the construction of a Single phase transformer.   **6**

     c) Draw and explain the Single line representation of a power system indicating generation, transmission and distribution of electrical power.   **8**