B. Tech Degree I & II Semester Examination in Marine Engineering June 2011

MRE 107 FUNDAMENTALS OF ENGINEERING –I

### PART- B ELECTRICAL ENGINEERING

Time : 1 ½ Hours   Maximum Marks : 50

I.   a)   Derive the expression to obtain the effective resistance of n resistors connected in parallel.   (4)

    b)   A direct current circuit comprises two resistors, A of 25 ohms, and B of unknown value connected in parallel, together with a third resistor C of value 5 ohms connected in series with the parallel group. The potential difference across c is found to be 90V. If the total power in the circuit is 4320 W, calculate: (10)
        i)   the value of resistor B
        ii)   the voltage applied to the ends of the whole circuit,
        iii)   the current in each resistor

    c)   What are ideal voltage and current sources?   (4)

OR

II.   a)   State and explain Thevenin's theorem.   (6)
    b)`   Determine the current in 20Ω resistor of the network shown in figure by Thevenin's theorem.   (12)
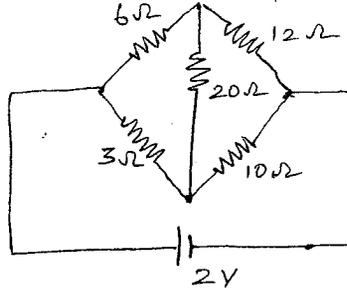
III.   a)   State coulomb's law of electro statics.   (4)

    b)   Derive the expression for capacitance of a parallel plate capacitor.   (4)

    c)   An iron ring has a cross section of $3cm^2$ and a mean diameter of 25cm. An air gap of 0.4mm has been cut across the section of the ring. The ring is around with a coil of 200 turns through which a current of 2A is passed. If the total magnetic flux is 0.24 mwb, find the relative peamealibility of iron assuming no magnetic leakage.   (8)

OR

IV.   a)   Explain the following: (6)
        i)   Hysteresis
        ii)   Fringing

    b)   Distinguish between self inductance and mutual inductance.   (4)

    c)   Two coils having 150 and 200 turns respectively are wound side by side on a closed magnetic circuit of cross section 1.5×10^{-2} m ^{2} and mean length 3m. The relative permeability of the magnetic circuit is 2000. Calculate: (a) the mutual inductance between the coils; (b) the voltage induced in the second coil if the current changes from 0 to 10A in the first coil in 20ms.   (6)

V. a) Explain the generation of alternating voltages.   (8)

    b) Define the following terms: (8)
        i)   time period
        ii) Power factor
        iii) Form factor
        iv) r.m.s value

OR

VI. a) Prove that the active power over a complete cycle in a purely inductive circuit is zero.   (6)

    b) A coil of resistance 10Ω and inductance of 0.02H is connected in series with another   (10)
        coil of resistance 6Ω and inductance of 15mH across a 230V, 50Hz supply. Calculate
        (i) the impedance of the circuit (ii) the voltage drop across each coil and (iii) the total
        power consumed by the circuit.

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