D 51222 (Pages : 4) Name.....

Reg. No.....

COMBINED FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2008

AI 2K 109 – BASIC ELECTRICAL ENGINEERING

(Common to EE, EC, IC, BM, BT)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions. Assume missing data.*

I. (a) State and explain ohm's law. Give its limitations.

(b) Define Magnetic circuit and compare electric and magnetic circuits.

(c) What are the factors on which the inductance of a coil depend? Desire the necessary expressions for calculating the inductance of a coil.

(d) Define average value and obtain the same for a half wave rectified voltage wave.

(e) (i) Define Loop and Mesh.

(ii) Define Q. factor.

(f) The following complex numbers are phasors; write the corresponding sinusoids both as cosine functions and as sine functions.

(a) $V = 10\angle -45°$;

(b) $50\, e^{j\pi/6}$.

(g) Define:

(i) R.M.S. Value.

(ii) Average Value.

(iii) Form Factor.

(iv) Peak factor.

(h) (i) Define power factor of an a.c circuit.

(ii) Find the equivalent resistance of 3 equal resistors connected in parallel.

(8 × 5 = 40 marks)

II. (a) Determine the thevenin and Norton equivalent circuits with respect to terminals A and B for the network shown in figure 1.

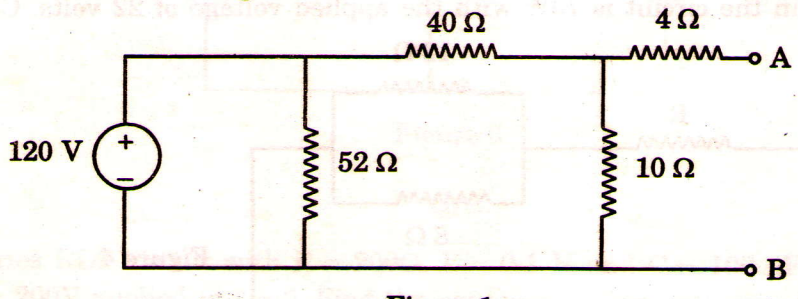

Figure 1

(8 marks)

Turn over

(b) Using Nodal method, find the current through 100Ω resistor of figure 2.

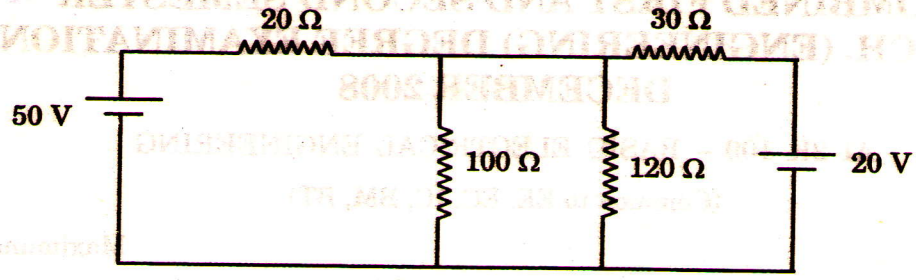

Figure 2

(7 marks)

Or

(c) For the circuit shown in fig 3. convert the current sources into the equivalent voltage sources and redraw the circuit. Then write down the mesh equation taking all the mesh currents clockwise. Give solution of these equations.

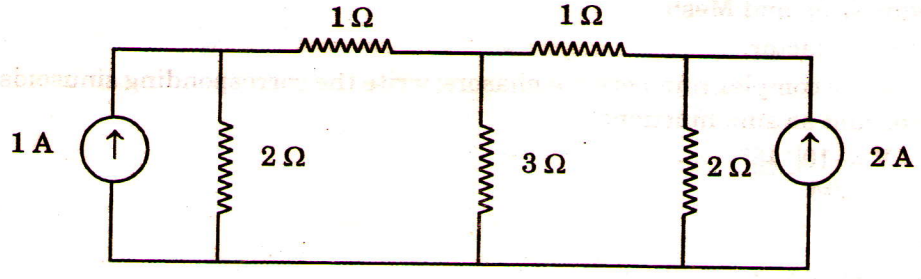

Figure 3

(8 marks)

(d) The flux produced in the air gap between two electromagnetic poles is 5×10^{-2} wb. If the cross sectional area of the air gap is $0.2m^2$, find (i) flux density ; (ii) magnetic field intensity ; (iii) reluctance ; (iv) permeance of the air gap. Find also the mmf dropped in air gap given the length of the air gap to be 1.2cm.

(7 marks)

III. (a) The resistance R is connected in series with a parallel circuit as shown in fig. 4. The total power dissipated in the circuit is 70W with the applied voltage of 22 volts. Calculate the value of R.

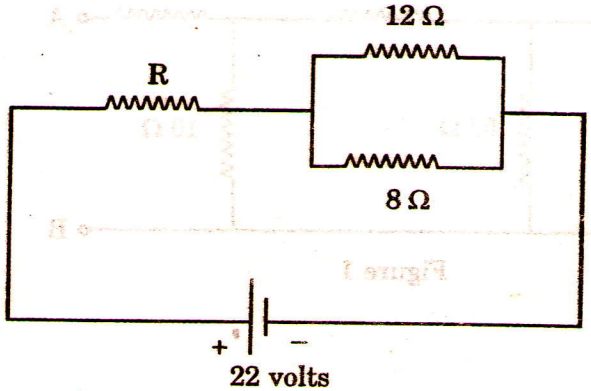

Figure 4

(7 marks)

(b) Obtain an expression for the capacitance of a coaxial cylinder of diameter d_1 and d_2 and length 'l'.

(8 marks)

Or

(c) A capacitor with two dielectrics is as follows : Plate area 100cm^2,
Dielectric – 1 $\varepsilon_{r_1} = 3$, Thickness = 3 mm
Dielectric – 2 $\varepsilon_{r_2} = 5$, Thickness = 2 mm
If a potential of 100V is applied across the plates, find the energy stored in each dielectric and potential gradient in each dielectric.

(7 marks)

(d) Obtain the current I in the 10Ω resistor in fig. 5. using supper position.

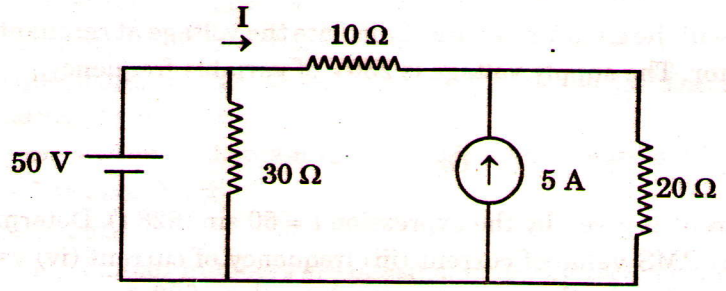

Figure 5

(8 marks)

IV. (a) A constant voltage is applied to a series RL circuit by closing a switch. The voltage across L = 25V at $t = 0$ and drops to 5V at 25m sec. If L = 2H, What must be the value of R?

(8 marks)

(b) In the circuit shown in fig. 6. Switch S has been in position B for a long time, At $t = 0$ it switches to position A, where it remains until t = 1ms, when it switches to position B. Determine and plot V for $t \geq 0$, Assume that the capacitors unchanged for $t < 0$.

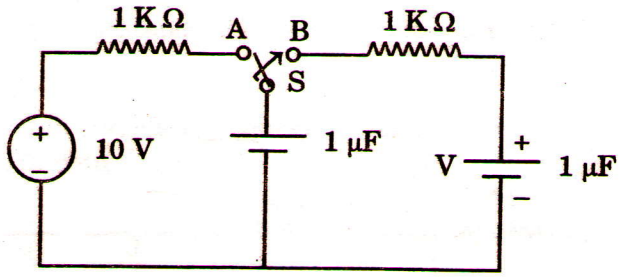

Figure 6

(7 marks)

Or

(c) A series RLC circuit with R = 200Ω, L = 0.1 H and C = 100 μF has a constant voltage V_{dc} = 200V applied at $t = 0$, Find the equation for current assuming the capacitor has no initial change.

(7 marks)

Turn over

(d) An impedance of 4-j, 10Ω is connected in parallel with an impedance 6 + j, 8Ω. The circuit is fed from a 230V 50 Hz supply. Find the current through each branch, total circuit current, circuit impedance, power factor active power, reactive power and apparent power.

(8 marks)

V. (a) A resistance of 1Ω and a capacitance of 1F are in series. An alternating voltage $v\ (t) = 2 \sin (t + \alpha)$ is applied suddenly. Find an expression for the voltage across the capacitor.

(7 marks)

(b) A choking coil of 10Ω resistance and 0.1 H inductance is connected in series with a capacitor of 200 μF capacitance. Calculate (i) the current (ii) the coil voltage (iii) the capacitor voltage. The supply voltage is 230 Volts at 50 Hz.

At what frequency will the circuit resonate? Calculate the voltage at resonant frequency across the coil and capacitor. The supply voltage is 230V of variable frequency.

(8 marks)

Or

(c) An alternating current is given by the expression $i = 50 \sin (628\ t)$. Determine (i) maximum value of current (ii) RMS value of current (iii) frequency of current (iv) value of current at $t = 6.25$ ms. (v) time taken by the current to reach a value of 20 A.

(8 marks)

(d) State and explain the maximum power transfer theorem.

(7 marks)

(4 × 15 = 60 marks)