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Total Number of Pages : 03

B.Tech
REE3C002

3rd Semester Regular Examination 2019-20
NETWORK THEORY
BRANCH : AEIE, EEE, EIE, ELECTRICAL
Max Marks : 100
Time : 3 Hours
Q.CODE : HR881

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 **Only Short Answer Type Questions (Answer All-10)** (2 x 10)

a) Define compensation theorm?

b) Define coefficient of coupling and its physical significance?

c) Two coupled coils with L_1 =0.6 = L_2 have a coefficient of coupling K=0.8. What is the the turn ratio $\frac{N_1}{N_2}$?

d) Prove that resonant frequency is the geometric mean of the two half power frequencies?

e) Why dot convention is used?

f) Usual notation, a 2-port network satisfies the condition A=D=1.5B=4/3 C. What is the value of Z_{11} of the network ?

g) What is the relation between resonant frequency and quality factor?

h) A first order linear system is initially relaxed . For a unit step signal u(t) , the response is v(t)= (1-e-3t) for t>0. If a signal 3u(t)+δ(t) is applied to the same initially relaxed system what will be the response ?

i) For the function L [f(t)]= $\frac{3s+1}{s(s^2+4s+5)}$, What is the value of $\frac{df}{dt}_{t=0+}$.

j) An initially relaxed RC-series network with R=2M Ω and c=1μF is switched on to a 10V step input. What is the Voltage across the capacitor after 2 seconds?

Part-II

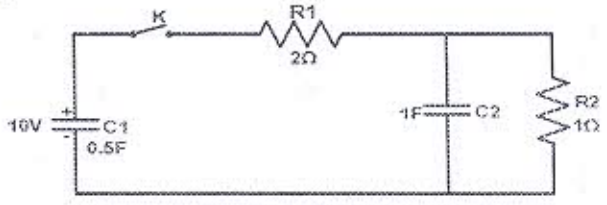
Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** (6 x 8)

a) A two-port network has the following parameters: Z_{22} = 40Ω, Z_{11} = 30Ω, Y_{22} = 0.05 S. Calculate the ABCD parameters of the network.

b) For a series RLC circuit with R=2 ohm, L=1mH and C=0.4μF and a supply voltage v(t)=20 sinwt, find:(a) the resonant frequency ω_o, (b) The half power frequencies , (c) The quality factor and bandwidth, (d) The amplitude of the current at ω_o.

c) The unit impulse response of current of a circuit having R=1Ω & C = 1F in series is given by [δ(t)-exp(-t)u(t)]. Find the current expression when the circuit is driven by the voltage given as [1-exp(-2t)] u(t).

d) In the given network capacitor C_1 is charged to 10 volts in the polarity shown. Capacitor C_2 is initially uncharged. At time t=0, switch K is closed. Using Thevenin's theorem find the current in resistorR_2.



e) The network equation for two port network give the current I_1 and I_2 at the two ports as

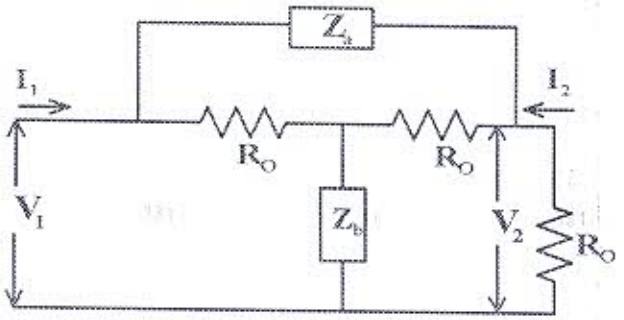
$$I_1 = 0.25V_1 - 0.2V_2 \text{ and } I_2 = -0.2V_1 + 0.1V_2$$

Determine the ABCD parameters for the Network and hence write the network equation.

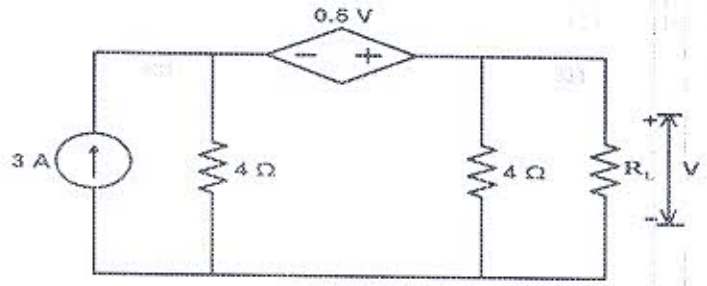
f) A coil having a resistance of 50Ω and inductances 10mH is connected in series with a capacitor and is supplied at constant voltage and variable frequency source. The maximum current is 1A at 750Hz. Determine the bandwidth and half power frequencies.

g) A sinusoidal voltage 25sin10t is applied at a time t=0 to a series RL circuit comprising resister R= 5Ω and inductor L=1H. By the method of Laplace transformation, find current i(t). Assume zero current through inductor before application of voltage.

h) Show that with $Z_a Z_b = R_o^2$ in the bridge T network of the accompanying figure, $\frac{V_2}{V_1} = \frac{1}{1+\frac{Z_a}{R_o}}$.



i) What will be the value of R_L to get maximum power delivered to it? What is the value of this power?



j) A series connected circuit has R=4 ohm, L =25mH. (a) Calculate the value of C that will produce a quality factor of 50 and BW. (b) Determine the average power dissipated. Take V_m=100 V.

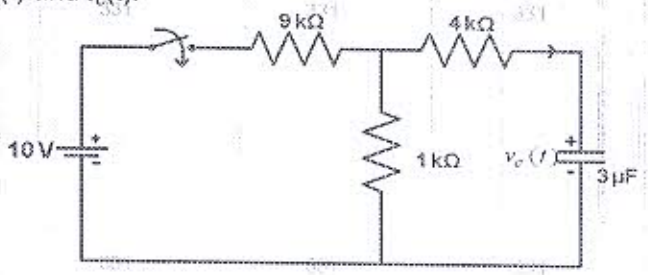
k) The response of a network to an impulse is $h(t)=0.18(e^{-0.32t} - e^{-2.1t})$.Find the response of the network to a step function using convolution theorem.

l) A coil of inductance L and resistance R, in series with a capacitor is supplied at a constant voltage from a variable frequency source. Find the values of that frequency, in terms of R , L and ω_0 at which the circuit current would be half as much as at resonance.

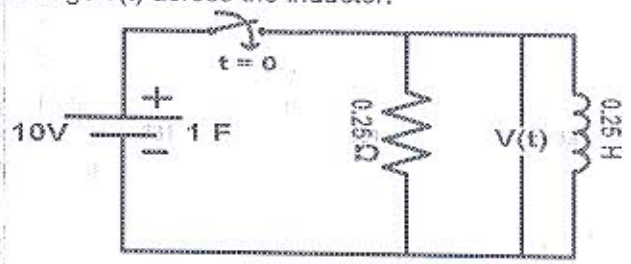
Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 In the network shown in figure, the switch closes at t=0. The capacitor is initially uncharged find the $v_c(t)$ and $i_c(t)$. (16)



Q4 In the circuit shown in figure, capacitor C has initial voltage V_c= 10V and at the same instant, current through the inductor is zero, the switch K is closed at time t=0. Find the expression for the voltage v(t) across the inductor. (16)



Q5 A network has two output terminals. A open circuit voltage at theses terminals is 260 Volt and current flowing through the terminal is 20A when the terminals are short circuited. Also, the current is 13A when a coil of 11Ω reactance and negligible resistance is connected across the terminals. Find the impedance components of the equivalent circuit feeding the terminals. What value of load impedance will give maximum power transfer and what is the value of power. (16)

Q6 In the network shown in figure, the switch is changed from the position 1 to the position 2 at t=0, steady condition having reached before switching. Find the values of i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t=0^+$. (16)