Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**
PEL3I101

3rd Semester Back Examination 2019-20
NETWORK THEORY
BRANCH : EEE
Max Marks : 100
Time : 3 Hours
Q.CODE : HB604

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) Which theorem obeys KVL and KCL?
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) What is the fourier transform of step function?
f) Write symmetry and reciprocity condition for Z parameter?
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) What is the necessary and sufficient condition of Positive real function?
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) In a two-element series network , voltage v(t) is applies, which is given by,
v(t) = 50 + 50sin5000t + 30sin10000t + 20sin20000t(V)
The resulting current is given as
i(t) = 11.2sin(5000t + 63.4 °) + 10.6sin(10000t + 45 °) + 8.97sin(20000t + 26.6 °) A
Determine the network elements and the power dissipated in the circuit.
b) A voltage, v(t)= $100e^{-25t}$ u(t) volt is applied to the input of an ideal low- pass filter having a cut-off frequency of 25 rad/sec . Calculate the percentage of the total energy transmitted through the filter.
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) Find the network for the following in Foster 2 and Cauer 1 Form

$$Z(s) = \frac{2(s+1)(s+3)}{s(s+2)}$$

e) The network equation for two port network give the current I1 and I2 at the two ports as
$I_1 = 0.25V_1 - 0.2V_2$ 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) Determine the impulse response of the linear system whose transfer function given as

$$H(j\omega) = \frac{3 + 2j\omega}{(jw)^2 + 6j\omega + 8}$$

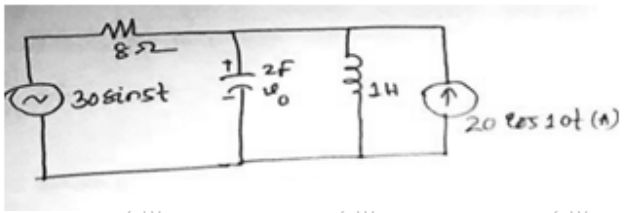
h) Write the limitation pole zero in a transfer function?

i) Synthesis the Foster II from network when its admittance function is given as

$$Y(s) = \frac{s(s^2+3)(s^2+5)}{(s^2+2)(s^2+4)}$$

j) The current in a 10 ohm resistor is $i(t)=10e^{-2t}u(t)$(A).What is the energy associated with the frequency band $0 \leq \omega \leq 2$ rad/s ?

k) Find Vo using Thevenin's theorem in fig – 1.



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 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. **(16)**

Q4 **a)** Write a short note on Cut set and Tie set matrix with examples. **(8)**

b) Show that sum of energy stored by the inductor and capacitor connected in parallel RLC circuit at resonance at any instant is constant and is given by CV^2. **(8)**

Q5 Design a high pass, constant-k type filter with T- section and π-section when the cut-off frequency is 8 KHz and the nominal characteristic impedance is 500Ω. Also determine the attenuation and phase constant for frequencies 5 KHz , 20 KHz. **(16)**

Q6 A two terminal network consists of a coil with resistance R and inductance L Henries and it is shunted by a capacitor C. The poles and zero of the driving point impedance function z(s) are poles $-\frac{1}{2} \pm j\frac{\sqrt{3}}{2}$,zero at -1.If $(j0) = -1$, Determine the values of R, L and C. **(16)**