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

Total Number of Pages : 03

B.Tech
PEL3I101

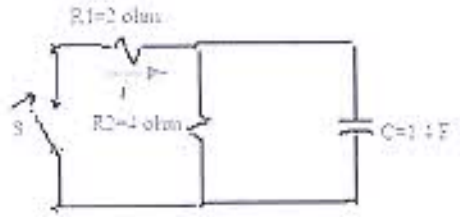
3rd Semester Regular / Back Examination 2018-19
NETWORK THEORY
BRANCH : EEE
Time : 3 Hours
Max Marks : 100
Q.CODE : E727

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 Short Answer Type Questions (Answer All-10) (2 x 10)

a) State Millman's theorem. Why this theorem is useful?
b) Draw the circuit model for current controlled voltage source for an inverting amplifier.
c) In the circuit containing R=2 ohm, C=1/17 F and L=1H in series. Find the roots that create the natural response of the system.
d) Find the poles and zeros of impedance for the following circuit.



e) Define tree and co-tree of the graph.
f) A series resonant circuit has an impedance of 500 ohm at resonant frequency. Cut-off frequencies are 10 kHz and 100 Hz. Determine the resonant frequency.
g) What is driving point impedance function in two port network?
h) Find the Fourier transform for the following function.

$f(t)=e^{-|t|} \quad 0<t<\infty=0 \quad t<0$

i) A resistor R is connected in series with two lamps of 12 V, 9 W across a 300 V supply. Find the value of R so that both the lamps operate at rated conditions. If one of the lamps is short circuited, find the current through the circuit and the power dissipated in each lamp.
j) What do you mean by synthesization of a network?

Part- II

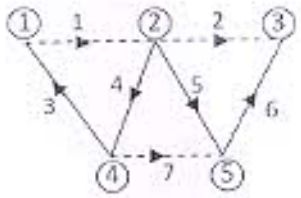
Q2 Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

a) Write the reciprocity and symmetry condition in h-parameter?
b) A dc circuit of source voltage has a $10\,M\Omega$ resistance in series with $1\,\mu F$ capacitor. What is the time constant of the circuit and how long will current flow in the circuit when RC combination is short circuited?
c) Plot the responses of the system for the poles located at different locations in s-plane and state the stability informations.
d) Write down the properties of positive real function. Check whether the function is positive real function

$$F(s)=\frac{2s^2+s+1}{s^2+s+2}$$

e) Find the cutoff frequencies of low and high pass filters.

f)



A graph is shown in the figure. Find the f-cutset and the cut-set matrices.

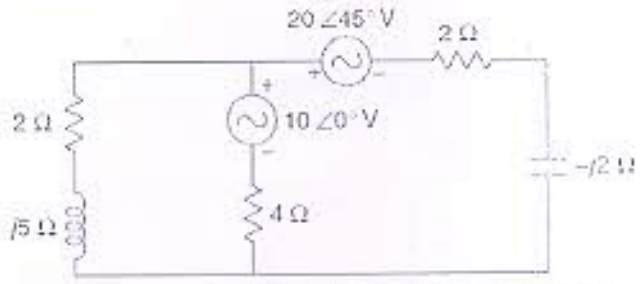
g) How do we define stability of a system? A system is represented by a relation given by $X(s) = R(s)\dfrac{100}{s^2 + 2s + 50}$. If r(t)=1, find the value of X(0) and X(∞).

h) Find the characteristic impedance of T network.

i) Test by continuity fraction expansion whether the polynomial $2s^6 + s^5 + 13s^4 + 6s^3 + 56s^2 + 25s + 25$ is Hurwitz.

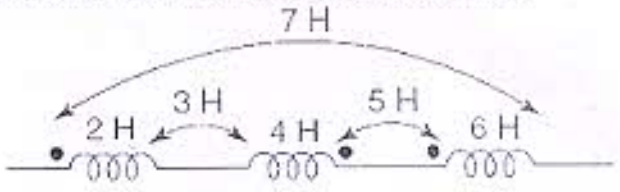
j) What is the function of an attenuator in two port network? How the attenuation is expressed in dB and in nepers.

k)



Find the voltage drop across the capacitor using superposition theorem.

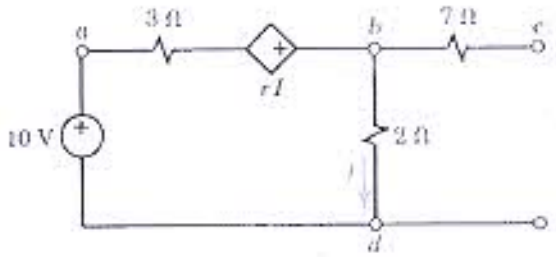
l) Find the equivalent inductance of the network shown in figure.



Part-III

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

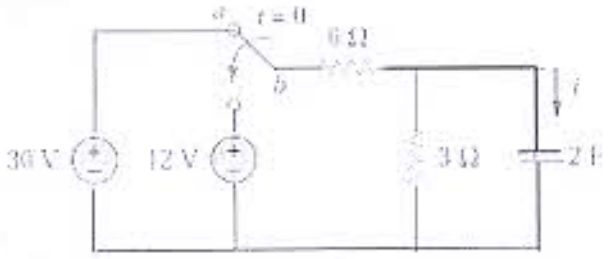
Q3 Determine the Thevenin equivalent for the following circuit where r=3 for the current-controlled voltage source. (16)



Determine whether the following functions are *LC*, *RC* or *RL* function:

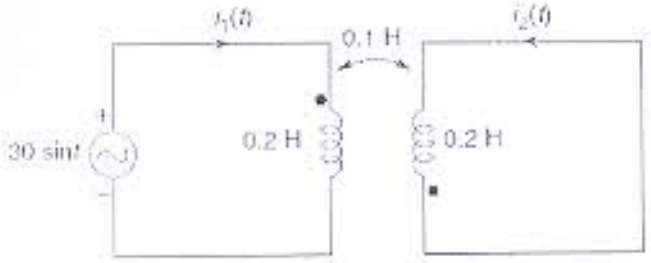
$$F(s) = \frac{2(s+1)(s+3)}{(s+2)(s+6)}$$

Q4 The switch in the Figure has been in position 'a'for a long time. At $t = 0$, it moves to position b. Calculate $i(t)$ for all $t > 0$. **(16)**



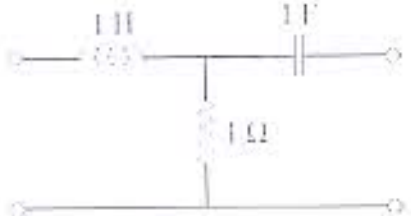
A low-pass filter is composed of a symmetrical π section. Each series branch is a 0.02 H inductor and shunt branch is a 2 μF capacitor. Find (a) cut-off frequency, (b) nominal impedance,(c) characteristic impedance at 200 Hz and 2000 Hz, (d) attenuation at 200 Hz and 2000 Hz, and (e) phase shift constant at 200 Hz and 2000 Hz.

Q5 Find $i_2(t)$ in the network shown. **(16)**



What are the restrictions on pole and zero locations for driving-point functions and restrictions on pole and zero locations for transfer functions [common factors in $n(s)$ and $d(s)$ cancelled]

Find the g parameters as functions of s for the circuit.



Q6 What is Fourier spectrum? Differentiate between the Fourier series and exponential Fourier series. Find the exponential Fourier series of the waveform shown in Figure. Draw the magnitude spectrum. **(16)**