## B.Tech I Year II Semester (R15) Supplementary Examinations December 2019 <br> ELECTRICAL CIRCUITS - I

Time: 3 hours

## PART - A

(Compulsory Question)
1 Answer the following: ( $10 \times 02=20$ Marks)
(a) Two capacitors having capacitances of $10 \mu F$ and $15 \mu F$ respectively are connected in series across a 200 V d.c supply. Calculate: (i) Voltage across each capacitor. (ii) Equivalent capacitance of the circuit.
(b) State the faradays first law of electromagnetic induction.
(c) Two impedances $(5+j 7) \Omega$ and $(10-j 7) \Omega$ are connected in series across a 200 V supply. Calculate the current and power factor.
(d) Define power factor.
(e) A series RLC circuit with $\mathrm{L}=1 \mathrm{mH}$ and $\mathrm{C}=1000 \mathrm{pF}$ is connected across a sinusoidal source of 20 V with variable frequency. Compute the resonant frequency.
(f) In a series RLC circuit, if the value of $L$ and $C$ are 100 mH and $0.1 \mu F$. Determine the value of R to give critical damping.
(g) What is the condition for maximum power transfer in DC circuits?
(h) List the applications of Thevenin's theorem.
(i) A two port network is characterized by $V_{1}=10 I_{1}+5 I_{2}$ and $V_{2}=5 I_{1}+12 I_{2}$. Find the transmission parameters A and C .
(j) The impedance parameters of a two port network are $Z_{11}=6 \Omega ; Z_{22}=4 \Omega ; Z_{12}=3 \Omega ; Z_{21}=3 \Omega$. Compute the $Y$ parameters of network.

PART - B
(Answer all five units, $5 \times 10=50$ Marks)

## UNIT-I

2 (a) Define Faraday's laws of electromagnetic induction.
(b) An iron ring of mean length 40 cm has an air gap of 2 mm and a winding of 300 turns. If the permeability of the iron core is 300 , when a current of 1 A flows through the coil, find the flux density.

OR
Determine the equivalent resistance of the circuit shown below.


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## UNIT - II

7 (a) Derive the Quality factor of the parallel RLC circuit at Resonance.
(b) Derive the Quality factor of the series RLC circuit at Resonance.

UNIT-IV
A $10 \Omega$ resistor and a 20 mH inductor are connected in series across a $250 \mathrm{~V}, 60 \mathrm{~Hz}$ supply. Find:
(i) Impedance of the circuit.
(ii) Voltage across the resistor.
(iii) Voltage across the inductor.
(iv) Active power.
(v) Reactive power.

## OR

A coil of power factor 0.6 is in series with a $100 \mu F$ capacitor. When connected to a 50 Hz supply, the potential drop across the coil is equal to the potential drop across the capacitor. Find the resistance and inductance of the coil.

UNIT - III
6 For the circuit shown in below. Determine the frequency at which the circuit resonates. Also find the quality factor, voltage across the inductor and capacitor at resonance.


State Thevenins theorem. Write the steps to be followed in applying Thevenins theorem.
OR
Verify the reciprocity theorem in the circuit shown in figure below and also calculate the transfer resistance.


UNIT - V
Derive the relation between transmission parameters and admittance parameters.
OR
For the h-parameter for the network shown below.


